The Veterinary Record

FOUNDED BY WILLIAM HUNTING, F.R.C.V.S., 1888.

No. 30. JULY 25, 1936. VOL. 48.

General Article

HORMONES AND PREGNANCY

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In an address given to the Glasgow and West of Scotland Branch of the British Medical Association in November, 1935,* there is much which should be useful in the work which the veterinary practitioner is called upon to carry out in his daily routine. The rapidly increasing knowledge of hormones, and the profound physiological effects which they are capable of producing in laboratory animals, are but stages in their application and utilisation for clinical practice—human and veterinary. It may be helpful to readers of the *Veterinary Record* to reproduce most of this address and to incorporate in it and emphasise certain specifically animal problems.

The gonads and the anterior lobe of the pituitary have of recent years been shown to produce certain hormones which bear an intimate relation to the development of sexual characteristics and to the performance of sexual and reproductive functions. During gestation, the foetus and its membranes also are probably capable of secreting some of these hormones. Many of these substances have now been isolated in a pure crystalline form, and even partially synthesised, whilst others are still being subjected to further purification and analysis. In particular, the hormones produced by the gonads have yielded more readily to chemical analysis, while those elaborated in the pituitary body are of a more complex nature and have not yet been isolated in a pure form.

HORMONES OF GONADIC ORIGIN

It may be well here to summarise very briefly the chief known sex hormones of gonadic origin, and to indicate some of the sites at which they are produced. *The ovary* produces "*oestrin*,"† the female sex hormone, which in conformity with the suggestions made by the Committee on Sex Hormones of the League of Nations, should now be called **oestrone**. It probably also may produce small amounts of male sex hormone. The active *Corpus luteum* produces *progestin* or **progesterone**, and another hormone. These exercise important functions concerned with the implantation of the fertilised ovum in the endometrium, with the control of the nutritive supplies to the foetus and with the maintenance of pregnancy (prevention of abortion). There is evidence to show that in some animals at least these hormones of the corpus luteum can be produced by the placenta in amounts adequate to maintain pregnancy even after the ovaries have been removed. *The testis* produces at least two hormones—**testosterone** and **androsterone.** These are concerned with the functioning and development of secondary sexual organs and since they are not concerned in pregnancy need not be further discussed here. *The placenta* and/or the *endometrium* play a hitherto not thoroughly understood part in hormone production. They can undertake progesterone secretion in the absence of ovaries (and therefore of *Corpora lutea*) in some animals and not in others; they can supply adequate amounts of oestrone in the pregnant mare (and in some other animals which has been oöphorectomised, to complete normal pregnancy; while there is evidence to warrant the assumption that they may elaborate a hormone which has hitherto not been identified.

HORMONES ACTING ON THE SECONDARY SEX ORGANS

The gonadic hormones can be divided into two classes, namely: (1) those substances which have been shown to affect essentially the male secondary sex organs; and (2) those responsible for the development and physiological changes in the female secondary sex organs. Both these groups contain several substances, closely related chemically, each of which is capable of bringing about in different doses definite end-effects.

It is, moreover, possible that, even under physiological conditions, more than one substance in a given group may be responsible for alterations in the sex organs. Thus, for example, there are quite a number of chemically closely related substances (to which the general term oestrin is applied) capable of bringing about oestrus changes in the rodent test animal, and there is no doubt that some, if not all, of these forms of oestrin can produce physiological alterations in the uterus when administered to the human subject. Similarly, work at present in progress is showing that more than one substance can produce effects on the male secondary sex organs (Butenandt, 1935; Ruzicka and Wettstein, 1935).

*"*Hormones and Pregnancy*" by J. M. Robson, M.D., D.Sc. Reprinted in *B.M.J.*, May 23rd, 1936.

†Throughout the remainder of this article, the term "oestrin" will be used in a generic sense to include all those oestrogenic substances which are allied to each other.

Although the general names of *male* and *female sex hormones* have been given to those hormones which appear to affect essentially the male and female secondary sex organs respectively, it must not be assumed that the secretion of these hormones is limited to one sex. On the contrary, both of these types of hormones seem to be produced, or at least excreted, in the male and in the female. Thus a male hormone can be recovered from the urine of women as well as of men, and in approximately equal amounts (Siebke, 1934); oestrin may also be present in quite appreciable quantities in the urine of men. In the stallion (but not in the gelding) considerable quantities of oestrin are excreted in the urine, although a fairly large survey shows that the amounts are irregular and not always so great as was at one time believed. Various explanations have been sought to account for this phenomenon, the most widely accepted being that the circulating male hormone of the stallion in the course of its utilisation in the system is broken down and one of the resulting products is oestrin, which is liberated and excreted by the kidneys.

Male hormone under certain conditions of abnormal sexual functioning is excreted by the female, and Butenandt and Kudszus (1935), Deansley and Parkes (1936) and Wolfe and Ginglinger (1936) have shown that a number of male hormones, including testosterone, possess the power of inducing the changes typical of oestrus when injected into the mouse.

Some considerable amount of evidence now shows quite clearly that in certain hypertrophic conditions of prostate and seminal vesicles, it is oestrin which is to a large extent responsible for the changes.

Hormones Acting on the Gonads

The hormones so far mentioned exert their effect directly on the secondary sex organs, and have no direct action on the gonads themselves. The anterior pituitary gonadotropic hormones, on the other hand, control the activity of the male and female gonads, but have no direct action on the secondary sex organs. The gonadotropic hormones are responsible for the growth of the gonads and for the production of the changes associated with sexual activity; hence they control follicular maturation, ovulation, and formation of the *Corpus luteum* in the female, and descent of the testes and spermatogenesis in the male. They also control the secretion of oestrin, *Corpus luteum* hormone, and the male hormone. There seem to be at least two gonadotropic hormones of the pituitary, one of which (prolan A) causes follicular maturation and the secretion of oestrin, while the other (prolan B) controls the formation and secretory activity of luteal tissue.

Gonadotropic hormones, used in the correct strength and at the proper time, might well serve to complete the descent of the testis in the cryptorchid horse, and so avoid the risks attending the removal of an intra-abdominal testis by operative means.

During pregnancy, large quantities of gonadotropic hormones are excreted in the urine of the human subject. These excreted hormones are very similar to those produced in the anterior lobe of the pituitary, and they possess many of the properties of these latter. Nevertheless, the pituitary and the urinary gonadotropic hormones are not identical, as can be readily demonstrated by certain of their actions on the ovaries of rodents. This difference is further emphasised by a consideration of the action of these hormones on the ovaries of primates (Engle, 1934). Experimental investigation has shown that the anterior pituitary gonadotropic hormones can bring about many of the normal changes witnessed in the ovary during the menstrual cycle in primates. On the other hand, the urinary hormones have little stimulating action on the ovaries of these animals, and appear even to cause an inhibition of their morphological development. Such findings need, of course, careful consideration when the question of using these hormones therapeutically arises.

In addition to the gonadotropic hormones, the anterior pituitary lobe also secretes another substance, *prolactin*, which is intimately associated with the activity of the mammary glands. The growth of these organs during pregnancy is due to some extent to the action of oestrin and progestin, but prolactin probably also takes a part in the control of the mammary development; moreover, the maintenance of lactation appears to be dependent on the action of this anterior pituitary hormone, though very recent work (unpublished) would appear to show that oestrone in some way exerts a degree of control over the quality of the milk secreted.

Hormone Production in the Pregnant Woman

It is a remarkable fact that the concentration of the sex hormones in tissues and fluids during pregnancy shows very marked variations in different species. This makes the evaluation of the functional significance of these hormones in gestation a matter of great difficulty. At the present stage of knowledge it is only possible to give the data for the various species and to draw a few general deductions.

In woman, oestrin excretion in the urine, which is low during the menstrual cycle, undergoes a gradual increase following conception. It reaches a maximum shortly before parturition and then falls. After expulsion of the uterine contents the fall of the oestrin excretion is very rapid. Some remarkable findings on the

nature of the oestrin excreted during pregnancy have been obtained by Marrian and others (1935), for they have shown that the oestrin present is in two forms, namely (1) a comparatively physiologically inactive form, now called *oestriol*; and (2) an active form of the hormone, now called *oestradiol*. The inactive form can be converted into the active hormone by hydrolysis.

Now, although the total amount of oestrin rises markedly during pregnancy, the amount of physiologically active hormone excreted in the urine remains quite low during the whole duration of gestation, but rises suddenly and markedly immediately preceding parturition. The amount of oestrin present in the blood rises gradually during pregnancy, reaching a maximum about the time of parturition. Unfortunately, no investigations have yet been performed on the state in which oestrin is present in the blood.

In addition to its presence in the urine and in the blood, large amounts of oestrin are also found in the placenta at various stages of pregnancy. Since the placenta (and the urine) also contain oestrin in subjects who have been ovariectomised during gestation, it seems probable that this organ is capable of elaborating the oestrous hormone. Large amounts of oestrin are also found in the faeces during pregnancy.

Immediately following conception there is a very marked increase in the excretion of gonadotropic hormones in the urine. This excretion rapidly reaches a maximum but falls somewhat in the later stages of pregnancy and towards the time of parturition. After parturition the gonadotropic hormone excretion falls very rapidly, reaching the level observed during the normal menstrual cycle within a week or less.

Conception is also followed by a very marked increase in the gonadotropic hormone content of the blood. This content rises during pregnancy and continues to rise right up to the later stages of gestation, thus differing from the excretion in the urine, which falls after reaching its maximum early in gestation. The placenta also contains large amounts of gonadotropic hormones during the whole period of gestation and at parturition. There is no direct evidence to show whether this organ actually produces gonadotropic hormone, or whether it merely stores it.

A remarkable feature of the gonadotropic hormones during gestation is their total or almost total absence from the pituitary. Several investigators have now confirmed the original findings of Zondek and Phillip that the anterior pituitary in the human subject contains none of these hormones during gestation, and the same applies to the organ at parturition. Whether this indicates a very rapid rate of secretion by which the hormones are discharged into the circulation as soon as they are produced, or whether it indicates that the anterior pituitary is quiescent, it is difficult to decide at present. In addition to oestrin and gonadotropic hormones, male hormone is also excreted in the urine during pregnancy, but the quantities are not significantly different from those present in the urine during the menstrual cycle.

Hormone Production in the Higher Primates

The hormone production in the higher primates other than the human appears to be very similar to that observed in the pregnant woman. In the chimpanzee, the urine during pregnancy contains considerable quantities of oestrin, and the same applies to the full-term placenta. The data suggest, however, that the hormone levels are rather lower than in the human (Allen, Diddle and Elder, 1935).

The pregnant urine also contains considerable quantities of gonadotropic hormones, giving a positive Aschheim-Zondek reaction (Zuckerman, 1935). A positive Friedman test has also been reported (Snyder, 1935). The data suggest that the level of the gonadotropic hormones is rather lower than in the human, though accurate quantitative results are lacking. Zondek has also reported a positive Aschheim-Zondek reaction with the urine of the orang-outang. It is also of interest to note that the urine of *Macacus rhesus* apparently shows no increase in gonadotropic hormone excretion during pregnancy.

It should be pointed out here that the Aschheim-Zondek reaction (or Zondek-Aschheim reaction) is a biological test for the presence of gonadotropic hormones carried out by injecting young female rats or mice which have not yet reached puberty, with prepared urine or blood. It is not a test for oestrin—a quite different reaction must be employed to identify oestrin. A positive reaction consists of the production of Graäfian follicles or, more often, haemorrhagic *Corpora lutea* or follicles in the hitherto inactive ovary of the test subject. The Friedman test also determines the presence of gonadotropic hormone. In it female virgin rabbits are used, and the reaction consists in the production of actual ovulation—a phenomenon which otherwise only occurs some ten hours after mating.

Hormone Production in the Equidae

Pregnancy in the *Equidæ* (horse, ass, zebra) is characterised by the production of both types of hormones produced in the higher primates, but there are certain important differences in the amounts of hormone produced, and in the time at which the hormones appear and disappear in the blood and urine. The results obtained in the mare are given here, since detailed investigations have been carried out only in that animal.

Oestrin appears in the urine between the fiftieth and ninetieth day after service. The

amounts present may be very large, up to 100,000 mouse units per litre or more, and the hormone excretion remains at a high level for the greater part of pregnancy. Towards parturition there is quite an appreciable fall in the oestrin content of urine and after parturition very little or none can be found. Large amounts of oestrin are excreted in the faeces. During the latter part of pregnancy another hormone —"equilin" or "equilenin"—appears in the urine of mares. Much still remains to be discovered about its functions and production. It is less powerfully oestrogenic in test animals.

That oestrin production is largely independent of ovarian activity is shown by the fact that after oöphorectomy in the pregnant mare there is only a temporary and comparatively slight fall in the oestrin secretion, which maintains its normal level in further stages of the uninterrupted gestation (Hart and Cole, 1934). Oestrin is also present in the blood of the pregnant mare, but in comparatively small quantities; even then the hormone only makes its appearance in the second half of gestation, but continues to be present up to full term.

Very little or no gonadotropic hormone is excreted in the urine of the pregnant mare, but nevertheless it is present in large quantities in the blood. The hormone first appears in the blood about the fortieth or fiftieth day of pregnancy, and its concentration then very rapidly increases until enormous quantities are present—150,000 units per litre or more. From about the ninetieth to the hundred-and-twentieth day the concentration decreases, and shortly afterwards the hormone can no longer be demonstrated in the blood. It is noteworthy that marked development of the ovaries begins at about the forty-fifth day of pregnancy. Formation of ripe follicles occurs, and this results either in ovulation and the formation of *Corpora lutea* or in the formation of *Corpora lutea atretica*. After the gonad-stimulating hormones have disappeared from the blood the *Corpora lutea* regress so that by the last stages of pregnancy the ovaries contain only small follicles.

In this connection it may be pointed out that the mare at about the eightieth day of pregnancy, when the concentration of gonadotropic hormones is exceptionally high, can be used to provide an active supply of gonadotropic hormone which may be used clinically to stimulate the production of ovulation in certain cases of mares which for pathological or other reasons have become sterile. The details of the technique are being investigated, but in general the method consists of removing half-a-litre of blood from a pregnant mare, preventing it from coagulating by citration, then centrifuging, standardising and injecting. It is probable that for equine sterility work the blood serum of pregnant mares will be the best source of supply, since interactions between the various bodies present need not present such difficulties as may occur when other sources are utilised. Care may have to be exercised, however, to avoid possible dangers from using serum from a mare of one definite blood group on a mare of another group.

It has already been stated that the gonadotropic hormones from the anterior pituitary and from human pregnancy urine show certain definite differences in their action on primate ovaries. Hamburger (1934) has investigated the properties of the gonadotropic hormones present in the serum of pregnant mares. He concluded that they were similar to those obtained from the pituitary, thus suggesting that they were hypophyseal in origin. Investigations of the hormone content of the pituitary of the mare during pregnancy offer some support for the point of view that it is at a maximum about the time when large quantities of gonadotropic hormone are present in the blood (Hellbaum, 1935; Catchpole and Lyons, 1934). In this respect the pituitary of the mare is quite different from that of the human, which contains no gonadotropic hormone during pregnancy.

In the mare the placenta also contains comparatively large quantities of gonadotropic hormone. It has been demonstrated in the chorion at very early stages of pregnancy, and it maintains its concentration in the chorion for some time after a decrease occurs in the blood (Catchpole and Lyons, 1934).

Thus, in the higher primates and in the *Equidæ* there is direct evidence that large quantities of oestrin and gonadotropic hormone are produced during pregnancy. In some other animals the production of oestrin alone can be definitely demonstrated.

Hormone Production in Other Animals

Comparatively large amounts of this hormone have been recovered from the urine in later pregnancy in cows and sows (Struck, 1935), and it has also been recovered from the placenta of the cow and sheep. In cows, the concentration of oestrin in the urine increases right up to the last stages of gestation (Anderson, 1934; Barrie, Patterson and Underhill, 1935).

Investigations on other animals have yielded very little direct evidence for an increased production of the sex hormones during pregnancy. Nevertheless, the alterations in the properties of the uterus of these animals offer indirect evidence that oestrin is produced in comparatively large quantities.

As regards the gonadotropic hormone content of the anterior pituitary, the position of the human subject is quite exceptional. In no other genus has an appreciable decrease been noted.

Indeed, in the mare, as already stated, and in the rabbit (Hill, 1934) there is an increased content at some stages of pregnancy.

Functional Significance of Hormones in Pregnancy

It will thus be seen from all the above data that the concentration of the sex hormones in body tissues and fluids during pregnancy shows very marked differences in various species. To some extent these differences may be dependent upon variations in the renal activity, which probably plays an important part in controlling selectively the rate and degree of excretion. This can be readily seen from a consideration of the results for the pregnant mare, in which large concentrations of gonadotropic hormones are present in the blood yet little or none is excreted in the urine, whereas a low oestrin concentration in the blood is seen at a time when very large amounts of oestrin are eliminated in the urine. It appears, moreover, possible that the renal function may show variations in a particular species at different stages of pregnancy, since otherwise it would be difficult to explain the fact that in the human the gonadotropic hormone concentration in the blood rises up to the later stages of gestation while the concentration in the urine falls somewhat after the marked initial rise.

The metabolic destruction of the hormone probably also varies in different species. That oestrin may be very rapidly destroyed has, however, been demonstrated both in the human subject (Robson, MacGregor, *et al.*, 1934), and in the rat (Zondek, 1934), while Catchpole, Cole and Pearson (1935) have shown that the concentration of gonadotropic hormones injected into the blood stream of the rabbit and the gelding is rapidly reduced, the hormones being probably destroyed. Similar evidence has also been advanced by Lipschutz, Alba and Vivaldi (1935).

Even allowing for the renal and metabolic factors, there appears little doubt that the actual production of the hormones must show marked differences in the various species. From this it would seem that the hormonic control of pregnancy cannot be identical in all types of animals. It is possible, however, that there are certain essential common factors controlling the course of pregnancy, but that variations on this common theme occur in different species and are responsible for the various results obtained. A consideration of the known evidence regarding the action of the sex hormones during pregnancy may bring to light these essential common factors, and thus help to elucidate the physiological details relating to individual species.

Function of Oestrin during Pregnancy

It appears likely that oestrin plays a part in controlling the alterations in the size, growth and blood supply of the uterus during pregnancy in a large number of species. In the higher primates the evidence derived from hormone examination of the blood and urine is, of course, quite convincing, when taken in conjunction with the known changes in the uterus, but studies of the changes occurring in the uterus of lower animals strongly suggest the view that in these also the oestrous hormone is concerned in the control of the uterine alterations during gestation (*see* Robson, 1934, for discussion of these changes and their significance).

There are apparently three sites of production of oestrin: (1) the ovarian substance and the follicular apparatus in all animals studied; (2) the *Corpus luteum*, which probably takes a part in the secretion of the hormone, at least in the higher primates, and contains considerable quantities of oestrin during the menstrual cycle and also during the earlier stages of pregnancy; and (3) the placenta and/or the endometrium, in which there is very strong evidence of the production of large quantities of the hormone. Removal of the ovaries, both in the human subject (Brindeau, Hinglais and Hinglais, 1934) and in the mare (Hart and Cole, 1934), does not interrupt its production. In lower animals also (rabbit, mouse) a study of the changes occurring after ovariectomy and hypophysectomy suggests that oestrin production from the uterine contents may occur (Robson, 1934).

Oestrin plays an important part in the control of the marked growth process occurring in the uterus during pregnancy. It also exerts certain effects on the physiological activity of the uterine muscle which are probably of great significance in the processes leading to the expulsion of the uterine contents.

It is well known that the uterus is quiescent during the early stages of gestation, and that it is only later when contractions begin; these increase in intensity, but it is only immediately at parturition that the powerful contractions necessary to expel the uterine contents normally occur. Now it has been shown experimentally that oestrin increases the reactivity of the uterine muscle to oxytocin (posterior pituitary active principle), and also increases its spontaneous rhythmic activity. It appears very likely that these effects are responsible for the increase in activity witnessed during pregnancy. Moreover, it seems quite possible that the sudden rise in physiologically active oestrin at the time of parturition is, in part, responsible for the marked increase in uterine activity which then occurs. It is to be noted that there is increased oestrin production during pregnancy in a large number of species that have been investigated, and thus that the relation between oestrin and uterine activity is of widespread significance. It is, however, highly

desirable that further work of an applied (clinical) nature be carried out to determine whether use might not be made of this possible function of oestrin before conclusions are reached.

Function of the Corpus Luteum during Pregnancy

Although the *Corpus luteum* hormone has not been recovered from any body fluids, it is highly probable that it is produced in a large number of species during pregnancy. It is, of course, secreted by the *Corpus luteum*, but, in addition, it may quite possibly also be produced in the placenta. The fact that it has been extracted from that organ is not necessarily evidence that the organ is a site of production; it may, as mentioned earlier, merely be concerned in storing any excess of the circulating hormone.

In a number of instances (the human being, mare, cat and guinea-pig) removal of the ovaries during pregnancy does not necessarily lead to abortion. It has been a matter of controversy for some time whether this meant that the luteal hormone was not essential for the maintenance of gestation in these species, or whether it implied that the hormone was produced elsewhere—for example, in the placenta. The evidence adduced by Courrier and Gros (1935) in their experiments on the pregnant cat seem to prove conclusively that the placenta, in that species at least, may secrete the luteal hormone. Evidence of a similar nature on the rat has also been given by Selye, Collip and Thomson (1935).

The luteal hormone is essential for the implantation of the ovum in the endometrium, and it probably also plays an important part in the control of the nutrition of the developing embryo, and in the growth of the uterus, although further evidence on these questions is necessary. In addition, it exerts certain effects on the physiological activity of the uterine muscle, namely: (1) it inhibits the reactivity of the uterine muscle to the oxytocic hormone of the posterior pituitary lobe; and (2) it inhibits the increase in spontaneous motility induced in the uterine muscle *in situ* by oestrin. It has, therefore, an action which is in part similar to that of oestrin (stimulus to growth of uterus) and in part antagonistic to it.

Unfortunately, these actions have only been satisfactorily demonstrated in the rabbit. There is some evidence that the first effect may also occur in the human uterus, but, on the other hand, it is definitely known that progestin does not inhibit the uterine reactivity to oxytocin in lower rodents (mouse, rat and guinea-pig). Moreover, in the guinea-pig the motility induced by oestrin is not appreciably inhibited by progestin (Bell and Robson, unpublished data), although in this animal the removal of the ovaries during pregnancy does not necessarily lead to abortion. It will thus be seen that these actions of progestin on the uterine muscle are still of doubtful significance in the control of pregnancy in animals other than the rabbit, and possibly the human being, though further investigations on the action of progestin on the uterine muscle, especially of primates, are highly desirable.

A considerable number of experiments have now been performed on the experimental production of abortion by the injection of oestrin in animals during the later stages of pregnancy. In certain species interruption of pregnancy can be brought about fairly early by the administration of crystalline oestrin (Marrian and Newton, 1935; Robson, 1935). The uterine reactivity in these animals is markedly increased, and in mice, as was originally shown by Parkes, the injection of oxytocin following a short period of oestrin administration results in the expulsion of live foetuses.

It is still a question to what extent these results can be applied in medical or veterinary clinical practice. Robinson and his co-workers (1935) have been able to increase the uterine activity in women during the later stages of pregnancy by the injection of large doses of oestrin; the most favourable effects were obtained in cases of uterine inertia. Bourne (1934) was unable to produce any effect in five cases investigated. Since the approximate amount of physiologically active oestrin excreted by the parturient woman is now known (Cohen, Marrian and Watson, 1935) it seems desirable to determine whether the doses of oestrin injected are sufficient to cause an increase in the excretion of the physiologically active hormone similar to that observed at parturition, and to correlate the increase in excretion with the clinical effects produced.

So far as work on domesticated animals is concerned, there is a large field awaiting exploration. It is not often necessary to induce abortion in pregnant farm stock; the problem is more often to prevent this occurring. In this connection vitamin E has a part to play, and the administration of progesterone, when this becomes available, should be investigated. At the same time there are numerous occasions when a stimulus to normal labour pains, *e.g.*, in a dystokia which has been corrected but is complicated by uterine inertia, would be very useful. Posterior lobe of pituitary hormone (pituitrin, oxytocin, ecbolin, etc.) though of great service is by no means constant in its effects, nor is it always adequate. The use of a physiologically standardised preparation of oestrone to increase the uterine sensitivity and reinforce the posterior pituitary hormone's oxytocic action should be a logical development in animal obstetric practice. It must, however, be realised that in the mare and cow especially,

an explanation will have to be sought for the production of large amounts of oestrin and its excretion in the urine during the middle third of the gestation period, without any obvious adverse effects on the sensitivity of the uterine muscle.

Function of Gonadotropic Hormones during Pregnancy

The question of the function of the gonadotropic hormones during pregnancy is at present one of the unsolved problems in the physiology of the sex hormones. It has indeed been suggested, on the basis of experiments performed on the rabbit, that they may inhibit the motility of the uterine muscle in a manner similar to that of progestin. Investigations on the guinea-pig fail to demonstrate any such direct action on the uterine muscle (Bell and Robson, unpublished data), even with large doses of the gonadotropic hormones, so that it is doubtful whether this effect is of any wide significance.

The problem is further complicated by our lack of knowledge as to whether these hormones may be produced by the placenta as well as by the anterior pituitary lobe. In the human subject, in whom the urinary gonadotropic hormones (excreted throughout pregnancy) possess properties somewhat different from the hormones present in the pituitary, the latter organ contains little or no gonad-stimulating hormone during pregnancy. In the mare, the gonadotropic hormones in the serum of which are similar in properties to those of the anterior pituitary body (Hamburger, 1934), the hormone content of the anterior pituitary is increased about the time (fiftieth to the hundredth day) when these hormones are present in the blood in large concentrations. In animals other than the higher primates and *Equidæ* no increase in gonadotropic hormone production can be demonstrated during pregnancy, but there is good evidence that in some of them anterior pituitary activity is essential during pregnancy; thus in the rabbit removal of the pituitary is followed by abortion, and in that animal the gonad-stimulating hormone content of the pituitary is appreciably increased during some stages of pregnancy (Hill, 1934).

It is not impossible that the production of anterior pituitary gonad-stimulating hormone during pregnancy—which is a time when the Graäfian follicles in the ovaries require no further stimulus—is incidental to the elaboration of the specific growth hormone produced by this gland and required for tissue growth by the intra-uterine foetus. It may be that the growth hormone cannot be produced unless gonadotropic hormone is also elaborated, and that while the former readily passes the placental barrier the gonadotropic hormone is "filtered out" and deposited in this structure.

A consideration of the available data suggests that in the human being the placenta may secrete gonadotropic hormones, but that in other species they are produced only in the anterior pituitary lobe. It must be emphasised, however, that these conclusions are hypothetical, and are chiefly given to illustrate directions in which research is proceeding. It is possible that, ultimately, convincing evidence will be obtained by experiments on hypophysectomised pregnant primates and mares.

Whatever their site of origin, the gonadotropic hormones must play an important part in controlling the ovarian, and especially the luteal, activity during pregnancy. It is of some significance that in the human being, in whom the gonadotropic hormones are produced during the whole of gestation, the *Corpus luteum* remains active throughout a great part of that period, whilst in the mare cessation of gonadotropic hormone production is followed shortly afterwards by degeneration of the *Corpus luteum* and inactivity of the ovary. It is important, moreover, that in the rabbit the maximum gonadotropic hormone content of the pituitary and the period of continued luteal activity during pregnancy occur at about the same time (Hill, 1934).

It is of interest to consider the relation of the anterior pituitary and luteal functions to the maintenance of gestation in various species. At least three types of relationships are observed; these are exhibited by the following:—

(1) Animals in which (*a*) removal of the pituitary is followed by atrophy of the *Corpus luteum*, and (*b*) removal of the ovaries does not necessarily cause abortion (for example, the guinea-pig). In such animals hypophysectomy may be followed by normal pregnancy and parturition.

(2) Animals in which (*a*) removal of the pituitary is followed by atrophy of the *Corpus luteum*, and (*b*) oöphorectomy is followed by abortion (for example, the rabbit). In such animals hypophysectomy is followed by expulsion of the uterine contents.

(3) Animals in which removal of the pituitary is not followed by atrophy of the *Corpus luteum*—for example, the rat and the mouse. In these animals hypophysectomy may be followed by normal pregnancy and subsequent expulsion of the uterine contents.

It will be seen that hypophysectomy leads to abortion only when degeneration of the *Corpus luteum* follows, and when oöphorectomy has similar consequences (for example, in the rabbit). The fact that the administration of progestin to the pregnant hypophysectomised rabbit will prevent abortion, and may be followed by a normal pregnancy and parturition (Robson, 1936) is additional evidence that in

that particular species the essential function of the pituitary in the later stages of pregnancy is the maintenance of luteal activity. Further evidence in support of this view is the fact that both pregnancy and the luteal function can be maintained in the hypophysectomised rabbit by the administration of gonadotropic hormone (Robson, unpublished data).

It is at present difficult to dogmatise about the hormonic control in animals in which removal of the ovaries does not lead to abortion, but the evidence presented here suggests that in these the placenta may be responsible for the continued secretion of progestin. If such is the case, the placental activity may be quite independent (in extent and duration) of any hypophyseal control—for example, in the guinea-pig. A similar independence of progestin secretion by the *Corpus luteum* from pituitary control may also be witnessed in species in which hypophysectomy during pregnancy does not lead to atrophy of the *Corpus luteum* (rat, mouse).

In the mare, it may be that during the phase of pregnancy when gonadotropic hormones can be demonstrated in the blood serum, *Corpus luteum* hormone is necessary to maintain pregnancy, but that so soon as the placenta has developed sufficiently (after about the hundredth to the hundred-and-twentieth day) it manufactures an adequate supply of progestin (or some other hormone with similar functions) and anterior pituitary hormone control becomes superfluous and consequently ceases.

Functions of Uterine Contents during Pregnancy

The foregoing discussion leads to the question, "What part do the uterine contents play in the control of the changes concerned in pregnancy and parturition?" It has already been noted that in some species removal of the pituitary may be followed by continued pregnancy and parturition (rat, mouse, guinea-pig), while in another (rabbit) the administration of progestin to the hypophysectomised animal is sufficient to maintain a normal gestation leading to parturition at the usual time. Moreover, in the rabbit the state of the uterus at parturition shows that the oestrous activity normally present has also occurred under the experimental conditions.

To what extent the hypophyseal activity is necessary for the maintenance of luteal function and production of oestrin during gestation and at parturition in the mare and in the primates is at present unknown. Incidentally, the possibility that the placenta may be responsible for gonadotropic hormone production during pregnancy in the human has already been noted.

A fact which is suggestive, and which is not perhaps so widely recognised as it should be, is that in the ewe the contents of the pregnant uterus are apparently able to inhibit further ovulation and oestrus, *before* any attachment has occurred between the blastoderm and its delicate primordial membranes and the maternal uterus. Grant (1934) showed that in this animal, although by the twenty-third to the twenty-sixth day after service there is no real attachment between foetal membranes and uterine cotyledons, yet oestrus, which should have recurred at the sixteenth to the seventeenth day, is inhibited. The functioning *Corpus luteum* of pregnancy has replaced the degenerating *Corpus luteum* of oestrus, at a time when the uterus to all intents contains an unattached (or in extreme cases a very loosely attached) minute foetal structure which it yet nourishes by uterine milk.

It is perhaps not profitable to speculate upon a hormone mechanism by which this phenomenon can take place until further light is thrown upon the various other functions of the uterine mucosa and of the placenta.

Amongst other animals, the limited evidence at present available seems to suggest that the uterine contents are, at least in the later stages of gestation, ultimately responsible for governing the production of those hormones which are responsible for the maintenance of gestation and the initiation and possibly the control of parturition. The finding of Newton (1935) that death of the foetuses in the mouse may be followed by the expulsion of normal placentae at the time of expected parturition offers additional evidence for that point of view. In so far as the production of luteal hormone is concerned, the uterine contents may act not only by controlling the extent and duration of activity of the *Corpus luteum*, but also by the secretion of the hormone itself. In so far as oestrin is concerned, it is probable that the uterine contents may secrete this hormone, though there is at present no evidence to indicate whether the secretion of oestrin by the ovary is under the control of the uterine contents. The mechanism by which the uterine contents control the extent and duration of the luteal activity (the mechanism which, in the rabbit, appears to be exerted through the agency of the pituitary) is at present unknown; the possibility that a new hormone (or hormones) may be involved cannot be excluded.

The changes occurring at parturition leading to the expulsion of the foetus and placenta may take place in the absence of the pituitary (both anterior and posterior lobes), and in animals with inactive ovaries. Normal parturition may occur at a normal time in pregnancy in cases in which the activity of the pituitary can be excluded, and in some animals in the absence of ovarian function. It would thus appear that the mechanism of parturition and time of its occur-

rence may be dependent essentially on the function of the uterine contents. It must be emphasised, however, that this statement is not a general one applicable to all species, but has been derived from experiments performed in some species and may not be true for all types of animals.

It is possible here to emphasise a very important practical bearing from an entirely different investigational field. Williams (1936) brings forward a hypothesis in which he postulates that foetuses carried beyond term should be regarded as evidence of imperfect uterine function. He suggests that in equines owing to a lowered plane of metabolic activity in the foetus, occasioned by a less perfect uterine nutritive supply, more time may be needed by the foetus to reach that degree of development which will enable it to survive independently. Consequently, the gestation period is prolonged. He postulates further, that even though gestation is prolonged, the foetuses from a delayed parturition never achieve maximum results in later life. His arguments are supported by data drawn from comprehensive records, collected by himself and others. It may be that the real reason must be sought, not merely by an appeal to nutritive agencies in the pregnant uterus and its contents, but rather by assuming a threshold level of nutritive activity below which those hormones which control the initiation and completion of parturition are not elaborated.

Indeed, a study of the physiology of the sex hormones in different species leads to the conviction that there exists a bewildering variety in the production and mode of action of these substances. In so far as their activity during pregnancy is concerned, it appears, however, possible that the diversity of action in this respect may be partly explained by the hypothesis that the uterine contents have, to various extents for different species, taken control of, or even superseded, functions otherwise performed by endocrine structures in the host organism.

[*This article is to be regarded as a review in which the work of other authors has been freely used.—Wm. C. M.*]

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See also, Allen, W. M. (1932.) *Sex and Internal Secretions*, Williams and Wilkins, Baltimore.

PROPOSED AMENDMENT OF MILK MARKETING SCHEME

The Milk Marketing Board have duly submitted to the Minister of Agriculture and Fisheries certain amendments of the Milk Marketing Scheme, 1933.

Copies of the amendments may be obtained on payment of sixpence per copy (post free) from the Milk Marketing Board, Thames House, Millbank, London, S.W.1., on application to the Secretary (D. P. Oliver, Esq.); or may be inspected on personal application at the beforementioned address between 9.30 a.m. and 5 p.m. on weekdays other than Saturdays, and on Saturdays between the hours of 9.30 a.m. and 12.30 p.m.

Any objections and representations with respect to the said amendments should be addressed to the Secretary, Ministry of Agriculture and Fisheries, 10, Whitehall Place, London, S.W.1., so as to reach him not later than September 2nd, 1936; objections received after that date will not be considered. Every objection must be made in writing and must state the grounds of objection and the specific modification required.

The Veterinary Record

July 25th, 1936.

THE RETIREMENT OF SIR F. HOBDAY FROM THE PRINCIPALSHIP OF THE ROYAL VETERINARY COLLEGE

IN our issue of the 11th of this month it was stated in our correspondence columns that a growing volume of letters upon the above subject had been received in the office of this journal. These letters continued to express the profound dismay of many of our readers at the news of Sir Frederick Hobday's retirement and their grave concern for what may possibly emanate from the action of the Governors of the Royal Veterinary College in accepting his resignation. Some readers have been apprehensive lest the Governors should be harbouring notions that the moment has arrived—with the almost complete rebuilding of the College, when the great gifts of public appeal with which Sir Frederick Hobday is so conspicuously endowed have achieved the fruition of their design when they (the Governors) appointed him in 1927, to the Principalship—that to equip and organise the imposing edifice for the erection of which he has laboured tirelessly during the last nine years a man who has talents of a different order is needed; and that, consequently, the time has come when the present Principal can be—summarily and inhumanly—dropped. Worse than all, they (our readers) fear that in making the change, the Governors might decide that the man needed was not to be found in the veterinary profession. We cannot bring ourselves to believe that the Governors would allow themselves to be misguided into committing such an act of folly. The peculiar phase in the present history of the College needs, we realise, the appointment to the Principalship of a man of proved ability in the management of an institution which has come into existence through a large expenditure of public funds. This institution needs immediate organisation for the most effective distribution of the resources made available from these funds to a permanent and specific purpose, namely, the training of students qualified to undertake the multifarious services now demanded of veterinary graduates. The construction, equipment, and organisation of the College to undertake this form of training have been dealt with authoritatively in the Martin Report (1929). The provisions laid down in that report prescribe, to our mind, the bare minimum in essential requirements for a modern veterinary training. We are confident that the Governors, if they should decide to accept definitively the resignation of the present Principal, will shortly be in a position to announce the selection to the post of a veterinarian who will possess eminently the capacity to undertake the organisation of the institution to purposeful effect.

In any event, let us repeat that it shall be to the lasting credit of Sir Frederick Hobday that his supreme talents were expended wholeheartedly in bringing into existence the structure which now remains to be further equipped and organised. Let us recall that in 1930 (July 24th) after the Government had agreed to sanction £150,000 towards the total sum of £250,000 (the large expenditure on reconstruction envisaged within the recommendations of the above Report) and when £30,000 only had by then been collected by appeal to private subscription, the Governors announced they could see no hope of raising the additional £70,000 necessary. We shall have occasion again to dwell upon the triumphant success of Sir Frederick Hobday's personal efforts, which may be gauged from the fact that only two years later (October 6th, 1932) it was announced that the Appeal Fund of the Royal Veterinary College had reached the total necessary to claim the Government grant of £150,000. The sum necessary was collected in this short time in the face of the traditional reluctance of agriculturists and the livestock industry to subscribe individually to voluntary projects of the kind, the very harmful suspicions wrongly aroused in the public mind by the activities of anti-vivisection societies, and the inability of the veterinary profession itself to subscribe a proportionately large contribution. It was collected mainly from that great section of the British public which is left unmoved by any argument put before it which lays stress upon the economic or scientific merits of a scheme but responds generously when appeal is made

Clinical Communications

CASTOR SEED POISONING

H. M. WILSON, M.R.C.V.S.
CUPAR-FIFE

History.—Eighteen cattle received one feed of a certain brand of linseed cake from a fresh bag of a supply of cake which had been in use for some time. Some hours later all 18 were off their feed and scouring, whereas other cattle receiving cake from other bags were unaffected. The owner dosed all the affected animals with a proprietary medicine, together with linseed oil and ginger. Seventeen of the animals apparently responded to this treatment, but the eighteenth, a black polled stirk, did not, and assistance was sought.

Course.—On examination the animal was found to be scouring badly, and appeared to be suffering much pain. Astringent medicine was prescribed, together with starch, the white of eggs and flour drinks. On the following day the stirk appeared to be no better and there seemed to be a tendency to convulsions. Chloral hydrate was prescribed, but death occurred shortly afterwards.

Post-mortem.—*Post-mortem* examination revealed some inflammation of the stomachs, a catarrhal enteritis, hypostatic pneumonia and a patchy inflammation of the liver and kidneys. The animal is said to have become "hoven" about ten minutes before death.

In order to substantiate a claim for compensation material from the carcase was sent away for analysis, also a sample of cake. Extracts from the analyst's report read: "Castor seed was found in portion of stomach contents received. Total weight of contents in tin 496 grammes. Weight of castor seed husk approximately 0·3 grammes, equal to 1·2 grammes of castor seed in portion of contents received. The linseed cake was examined for the presence of poisons and substances likely to be injurious to health: arsenic, antimony, lead and other metallic poisons were tested for with negative results. Castor seed husk was found in abundance in the cake. The substance in castor seed, ricin, is a strong poison."

It is understood that a percentage of castor seed husk is permitted in cake, actually up to 0·002 per cent. The percentage found in the sample of cake in this case amounted to 0·540 per cent.

AN UNUSUAL CASE OF "SHIVERING" (?)

H. M. WILSON, M.R.C.V.S.
CUPAR-FIFE

History.—In October, 1935, I was called to a six-year-old Clydesdale gelding, the property of a coal merchant and which had been purchased some six weeks previously. At or just after purchase the animal developed a "cold" but did not receive veterinary attention. Some two weeks after the "cold" had cleared up (it lasted about two weeks) the animal commenced to shake its head and was now a source of concern, since it seemed to be irritated in some way and was inclined to move off whilst delivery of coals was being made. There seemed to be no connection between the weather and the condition.

Examination.—Observation showed that the muzzle and eyelids twitched; the ears did not twitch but seemed to be moved more than usual and not in the ordinary manner—the head was shaken from side to side and up and down. The horse was worse in the yoke than in the stable. The teeth were examined and found sound although somewhat in need of rasping, which was done. The ears were examined and syringed with no beneficial results. The horse showed no sign of deafness (it was thought that there might be some affection of the auditory tubes). Further examination revealed nothing, since the horse seemed in every way normal apart from the symptoms stated. It was concluded that the condition was one of chorea, shivering or neuritis, or something of that nature. It should be added that the type of headgear was varied with no encouraging results. It is probable that the condition had some relationship with the fact that the animal had a cold a short time previously, as stated.

Treatment.—The animal was put on bromide and arsenic for a time.

Course.—In May, 1936, I was called to the horse, since he had injured himself in the stall by getting "hanked." I took the opportunity of asking the driver whether he considered the nerve condition to be better or worse, receiving the reply that the horse was no worse. The driver added, however, that "he (the horse) could almost foretell the weather"—a statement which is opposed to that made in this connection earlier in this communication.

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to its inherent love of animals and kindness to the sick and suffering. No one, we can say with confidence, could have succeeded in this appeal as Sir Frederick Hobday has done.

A sanctuary for okapis is to be formed in the Belgian Congo in the Province of Kibali Ituri, which adjoins Uganda, and in it the digging of pits for the trapping of antelopes is to be forbidden in case okapis might fall into them. A white game warden is to be put in charge of the sanctuary.

Annotation

MALIGNANT CATARRHAL FEVER

[**I.—"Contribution à l'étude expérimentale du Coryza Gangréneux."** Rinjard, P. (1935.) *Rec. Méd. vét.* **111.** 335-356.

[**I.—"Contribution à l'étude de l'étiologie du Coryza Gangréneux."** Rinjard, P. (1935.) *Rec. Méd. vét.* **111.** 391-406.

III.—**"Le Coryza Gangréneux en Lithuanie."** Aleksa, Professor (1935.) *Rec. Méd. vét.* **111.** 274.

IV.—"Transmission Experiments with Bovine Malignant Catarrh." Daubney, R., and Hudson, J. R. (1936.) *J. Comp. Path.* **49.** 63.]

It was following upon the stimulating work of Anker (1832) that malignant catarrhal fever (synonyms: bösartiges katarrhalfieber der rinder, coryza gangréneux, febbre catarrale infettiva, snotsiekte) first came to be considered as a clinical entity and a disease of an infectious nature. The earlier experiments, however, made subsequently in attempts to transmit the disease by the inoculation of blood or of nasal and lachrymal discharges, gave uniformly negative results. Likewise no success attended experiments to infect healthy cattle by inoculation of cultures of divers micro-organisms isolated from infected animals, and there was no experimental evidence to suggest that the disease was contagious.

The first publication of note within more recent years was that of Mettam (1923) [ninth and tenth reports, Director of Veterinary Research—Union of South Africa] who described a disease existing in South Africa called "snotsiekte" (catarrhal disease) which he believed was distinguishable from malignant catarrhal fever as described in Europe in that he claimed to have transmittd the disease to healthy cattle by the inoculation of large quantities of blood collected from sick cattle. He believed also that another differentiating feature was the enlargement of the lymphatic glands in cattle infected with "snotsiekte." However, the attention of Götze and Liess (1929) [in *Deuts. tierärztl. Wschr.* **37.** 433] was drawn to Mettam's observations while they were studying malignant catarrhal fever in Germany. After due consideration of his findings they formed the opinion that the two diseases were identical. This view is now generally accepted since it has now been claimed also by Götze and Liess and by the several investigators whose work is under immediate discussion that malignant catarrhal fever in Europe can also be transmitted by the inoculation of large quantities of blood and moreover the lymphatic glands are enlarged in the disease, as observed in Europe.

Götze (1930) [in *Deuts. tierärztl. Wschr.* **38.** 487] gave a complete and very useful clinical account of malignant catarrhal fever and described four different types—the peracute, the alimentary, the "head and eye" and the mild type. It appears that the "head and eye" form is the most common.

In summarising the results obtained at Hannover over a number of years he stated that it had been found possible to transmit the disease in 13 out of 34 attempts (40 per cent.) by the transfusion of blood from diseased to healthy cattle. The incubation period varied from 16 days to 63 days and four serial passages were effected.

Rinjard (*see* I) now reports very similar results. In five out of eight cases he states that he transmitted the disease to six healthy cattle by the inoculation of large quantities, 200 c.c. to 500 c.c., of blood collected from sick animals.

Götze (1930.) (*loc. cit.*) stated that he had made some filtration experiments with serum separated from infective blood. No conclusions, however, can be drawn from his results as blood stored even for a short time was non-infective.

Daubney and Hudson's experiments (*see* IV) in cattle consist of two series. In the first series, experiments were made with what they designate "mild strains" of the infective agent. It is of interest to give their results in some detail; *viz.* (*a*) three cattle showing symptoms like those described in malignant catarrhal fever were collected from a farm where 30 to 60 calves had been lost while in their first year. These three animals were bled and the pooled blood inoculated intravenously (dose not stated) into six cattle. Four of these animals reacted in from six-and-a-half to ten weeks, showing high temperature lasting three to eight days and nasal and lachrymal discharges, at first watery and later mucopurulent, hyperaemia of the buccal mucosa, ulceration of the gums, etc. All four animals subsequently recovered and subinoculations made with 5 to 20 c.c. doses of their blood into six healthy cattle produced reactions in two. A further passage into seven animals, however, gave negative results.

(*b*) Seven cattle were inoculated with citrated blood received from the native reserve and stated to have been drawn from a typical case of malignant catarrhal fever. Four of these seven animals reacted on the seventh and eighth day (a remarkably short incubation period when compared with the minimum of 14 days in the case of the so-called "extremely virulent" "head and eye strain" referred to later). Subinoculations of blood into four cattle gave negative results. Negative results were

obtained also with three other "strains" from cattle affected with the disease.

The origin of the "head and eye strain" employed in the second series of experiments was not determined. A calf fell ill with symptoms of malignant catarrhal fever at the laboratory farm. It had been in contact with a wildebeest calf and also an ox. The wildebeest calf had died but death was believed to have been due to dietetic errors and the ox was ill from what may well have been malignant catarrhal fever, although this was not realised at the time. In view of what will be said later about wildebeest in relation to malignant catarrhal fever in cattle, it is not possible to exclude the possibility that the calf may have become infected from the wildebeest calf which itself showed no symptoms of malignant catarrhal fever. Starting with the spontaneous case in the calf, Daubney and Hudson report that they succeeded in infecting 33 out of 36 cattle experimentally, and made four serial passages. In all these animals the disease terminated fatally. Infection was transmitted by the subcutaneous inoculation of large quantities of defibrinated blood, 100 to 275 c.c., taken during the febrile reaction [*see* I—Rinjard found that it was not possible to correlate infectivity of the blood with the temperature reaction] and by the inoculation into lymph glands of suspensions of brain or/and lymphatic gland pulp collected at death. Evidence is also submitted which the authors believe strongly suggests that infection was transmitted from an infected to a healthy calf which was placed in close contact with it. [Eighteen cattle were infected with blood, five with brain suspensions, six with lymph gland pulp and four with a mixture of brain and lymph glands.] The average period of incubation was 20 days with a maximum of 60 days and a minimum of 14 days. The duration of the disease averaged seven to eight days, with a minimum of 4 days and a maximum of 25 days.

The symptoms observed in experimental infections did not differ from those described in cases occurring under natural conditions, *viz.*, three or four days before the rise in temperature, the superficial lymph glands were more tense than normal and there was a watery discharge from the eye. With the initial rise in temperature, the sclerotic and buccal mucous membranes were found to be hyperaemic. Photophobia was sometimes observed. The catarrhal discharges increased and became yellow and muco-purulent. There was considerable dyspnoea, with stertorous nasal and tracheal râles. Sometimes an ulcerative stomatitis was recorded. In some cases the head appeared swollen and the superficial lymph glands were considerably enlarged. Symptoms referable to lesions in the nervous system were noted frequently. Diarrhoea was observed twice only in 33 cases (*cf.* cattle plague, in which diarrhoea is the rule). In malignant catarrhal fever symptoms may be observed before the temperature rises, whereas in cattle plague symptoms such as muco-purulent lachrymation and nasal discharge and hyperaemia of the gums do not appear until after the temperature begins to fall. [Other differentiating features between cattle plague and malignant catarrhal fever are that in the former the blood may be infective in doses as small as 1/500 to 1/5,000 of a c.c., whereas in malignant catarrhal fever *fatal* infection has been attained only with doses of blood varying from 100 to 500 c.c. Again, in rinderpest the nasal discharges are infective while those workers who have examined the nasal discharges in malignant catarrhal fever have not found them to be infective.] The pathological picture on *post-mortem* in the experimentally-infected animals was similar to that seen in cases of the disease occurring under natural conditions and the description given of the lesions which were found in the respiratory system, digestive system, nervous system and the circulatory and lymphatic systems conforms in general with that given by other investigators, *viz*:—

Respiratory System.—The turbinates and septum of the nose showed inflammatory lesions varying from congestion to extensive ulceration, occasionally with heavy diphtheritic deposits and numerous petechiae. In about 60 per cent. of cases there was intense congestion of the larynx which was covered with petechial haemorrhages and occasionally ulceration of the organ was observed. Similar lesions were sometimes seen in the trachea. The lungs were generally oedematous and in about 50 per cent. of cases there was atelectasis, hepatisation or even purulent broncho-pneumonia. The lung lesions were always confined to the anterior lobes. The pleura also showed petechial haemorrhages.

Digestive System.—The mouth was found to be normal in approximately 30 per cent. of cases. In the rest there were submucous haemorrhages on the tongue, diffuse ulceration of the gums, tongue, cheeks and palate, accompanied by diphtheritic deposits. The intensity of these lesions varied considerably. Petechial haemorrhages were found also in the mucosa throughout the whole intestinal tract including the abomasum. In the majority of cases, however, the mucous membrane of the caecum and rectum showed few or no haemorrhages (*cf.* cattle plague, in which extensive haemorrhagic lesions are found in these sites). The liver was very much enlarged almost without exception and showed distinct mottling due to aggregations of infiltrating cells round the blood vessels.

Urinary System.—The kidney showed mottling, due to infiltrative lesions, similar to that

seen in the liver, and sometimes also white or yellowish "infarcts."

Circulatory System.—The spleen was usually swollen and subcapsular haemorrhages were seen. The lymphatic glands throughout the body were always enlarged and sometimes haemorrhagic. Haemorrhagic lesions were commonest and most intense in the lymph glands of the region of the throat.

Petechial haemorrhages were sometimes seen on the epicardium and degenerative and infiltrative lesions were also noted occasionally in the myocardium.

Nervous System.—In about 80 per cent. of cases there was congestion of the brain, or gross haemorrhages were present. Occasionally large extravasations of blood were seen covering the posterior third of both cerebral hemispheres and the cerebellum. Sub-arachnoid haemorrhages were observed also in some cases in the medulla and cervical region of the cord.

The information given with regard to the histological examination of the nervous system is meagre, but it is important to note that although infiltrative lesions similar to those described by Dobberstein (1925) and Glamser (1926) were found in the brain and cord, the nuclear inclusions of Joest Degen, commonly associated with infection with Borna disease, were not found.

Although Mettam, Götze and Liess, and now Rinjard, and Daubney and Hudson have reported successful transmission in cattle of malignant catarrhal fever by the inoculation of blood, Dobberstein and Hemmert-Halswick (1928) [in *Z. InfektKr. Haustiere*, **34**, 160] and Stolnikoff (1933) [in *Z. InfektKr. Haustiere*, **43**, 100] failed to infect cattle by this means.

Daubney and Hudson lay stress on the lack of uniformity in their results of experiments made to transmit the disease by inoculation of blood obtained from different sources, and are of the opinion that this is due to the existence of different "strains" of the infective agent, "mild" and "virulent." It is to be noted, however, that in their earlier work with "mild" strains they were employing, in certain of their tests at least, much smaller amounts of blood —5 to 20 c.c. as compared with 110 to 275 c.c. in the later experiments with the "virulent" or "head and eye" strain. However, Götze and Liess were inclined to the same view of the existence of transmissible and non-transmissible "strains."

Götze and Liess working with a "transmissible" European "strain" and Mettam in his experiments with "snotsiekte" in South Africa both failed to observe transmission of the disease among cattle by direct contact infection. Mettam attributed the occurrence of "snotsiekte" in cattle to contact with wildebeest which he believed might act as carriers of the infective agent without themselves showing symptoms. In support of this hypothesis he claimed that he had transmitted the disease to cattle with the blood of an apparently healthy wildebeest which had been shot. It is reported that the Masai natives in Kenya and Tanganyika, where malignant catarrhal fever has been recognised for many years, employ the same native word for wildebeest and the cattle disease, thus signifying their belief in the relationship between the two. One opinion held by the Masai also is that the disease is contracted by cattle only when they graze on ground where a wildebeest calf has lain and shed its coat or on ground contaminated by the afterbirth of calving wildebeest, and indeed cases of "snotsiekte" occur annually in the months of April, May, June and July, which is the period during which the wildebeest calves. Daubney and Hudson, however, report that from time to time they have observed cases of a relatively mild form of malignant catarrhal fever in animals coming from farms so situated as to preclude any possibility of contact between cattle and wildebeest.

Götze and Liess (1930) and Götze (1930), working in Germany, submitted evidence which they believed strongly suggested that apparently healthy sheep can by close contact transmit infection to healthy cattle. Moebius as far back as 1887 had made a similar suggestion. They found that in 80 out of 85 centres of infection sheep were associated with the cattle. In one farm some heifers housed with sheep were the only cattle infected, and the milch cows and fattening cattle housed elsewhere were not attacked by the disease. They state that it proved to be sufficient to separate the heifers from the sheep to eliminate the disease on the premises. On other farms similar observations were made. Further, they introduced three apparently healthy sheep, collected from a farm where malignant catarrhal fever was occurring among the cattle, on to premises where no disease existed and cases of the disease appeared among the cattle.

Götze and Liess were persuaded from their observations that direct contact infection among cattle can play only a secondary rôle in the origin of new centres of infection.

Rinjard (*see* II) has made similar observations as regards the part probably played by sheep in the spread of malignant catarrhal fever. On the other hand, from observations made on one particular set of premises, he believes that if the sheep could be incriminated, infection spread from the sheep to the cattle in this particular case without direct contact between the two, although Götze and Liess believed this factor essential for the spread of malignant catarrhal fever from apparently healthy sheep to cattle.

Aleksa (1935) (*see* III), in reply to a questionnaire sent out to veterinary surgeons, was informed that 159 cases of malignant catarrhal fever were observed in Lithuania during the years 1930-34 and in 120 of these there was reported to be the association of sheep with the cattle and in 37 cases there appeared to be no such association. Usually the disease occurred sporadically, only one or two cattle on the same farm showing symptoms. When the disease appeared as an enzoötic cases recurred on the same premises for several consecutive years.

Mettam and Götze and Liess considered the possibility of the disease being transmitted by some arthropod vector, but they made experiments only with lice and sheep keds and with negative results. The means by which cattle might become infected from sheep or wildebeest is still an unsolved problem. The experiments of Zanzucchi (1934) [in *Clin. Vet. Milano*, **57**, 689], who reported successful transmission of the disease to sheep and goats by the inoculation of blood from infected cattle, await confirmation. This author claimed also to have obtained infection in a calf by contact with goats which had themselves been infected by contact with inoculated lambs. [The experimental investigations on malignant catarrhal fever are at present in a very incomplete and uncertain state. It seems surprising that the nasal and lachrymal discharges are non-infective in a disease of this nature (it may be that they have not been tested early enough). That the inoculation of such large quantities of blood is apparently necessary to transmit the disease suggests that this is not the ideal material in which to search for the infective agent.

The question of the existence and extent of "carrier" infection in animals such as sheep and wildebeest must be regarded at present as unsettled.]

Daubney and Hudson have made some experiments to infect rabbits with malignant catarrhal fever. Now on reference to the previous literature on the subject one finds that there is considerable confusion of opinion as to whether this disease has been transmitted to rabbits or not, and the position is further complicated by the fact that as a result of experiments on rabbits some authors have advanced the opinion that malignant catarrhal fever is either a form of Borna disease or a very closely related disease. Glamser (1926) [in *Deutsche tierärztl. Wschr.*, **34**, 312] and Dobberstein (1925) [in *Berl. tierärztl. Wschr.*, **41**, 177] described perivascular and parenchymatous cellular infiltrations as well as alterations in the ganglion cells of the brain of cattle dead of a disease which they had diagnosed as malignant catarrhal fever. Lesions of a similar nature are also found in Borna disease. Ernst and Hahn (1927), who made some experiments on malignant catarrhal fever of cattle, also drew attention to the similarity of the lesions in the brain of cattle dead of the disease with those found in Borna disease. They inoculated a rabbit with brain material from a bovine animal dead of what they believed was malignant catarrhal fever. In this rabbit a disease was produced after 54 days, and it died on the sixty-first day. The disease was transmissible in series by intracerebral inoculation, and the Joest Degen inclusion bodies associated with Borna disease were demonstrated. They concluded that malignant catarrhal fever is produced by a virus that is very closely related to or even identical with that of Borna disease of horses.

There are two possible explanations for Ernst and Hahn's results. One of the explanations has already been suggested by Nicolau and Galloway (1928) [Medical Research Council, Special Report Series No. 120, H.M. Stationery Office, London, p. 11], *viz.*, "it would seem not improbable that if the cattle examined by Ernst and Hahn had not in addition to malignant catarrhal fever a concomitant infection with Borna disease some of the cases described as malignant catarrhal fever of cattle were Borna disease."

The other explanation has been suggested by Ernst himself in a later paper [in *Arch. wiss. prakt. Tierheilk.* (1931), **63**, 867.]

It may be recalled that the earlier experiments of Zwick, Seifried and Witte (1926) and Nicolau and Galloway (1928) had shown that a normal rabbit does not contract Borna disease from an infected rabbit when placed in the same cage with it. Later, however, Galloway and Nicolau (1929) [in. *C. R. Soc. Biol.*, **100**, 537 (February 23rd, 1929)] showed that under certain conditions rabbits may become infected with Borna disease by contact without showing symptoms of the disease. Such rabbits may not show any signs of the latent infection until a trauma is produced in the brain by inoculation of sterile saline. Later Zwick, Seifried and Witte (1929) [in *Arch. f. wiss. Tierheilk.*, **59**, 525 (May 1st, 1929)] confirmed and extended this observation.

Ernst in his later paper reviewed the results of his experiments in the light of these later observations of Galloway and Nicolau and Zwick, Seifried and Witte, and pointed out that the original rabbit of their malignant catarrhal fever series had before inoculation been kept in a box with two other rabbits which three weeks previously had been inoculated with the virus of Borna disease but had not then developed symptoms.

Zwick and Witte (1931) have also produced results which would tend to confirm Ernst and

Hahn's opinion as to the relationship of Borna disease to malignant catarrhal fever. Whether similar explanations to those suggested to explain Ernst and Hahn's results could be submitted to explain Zwick and Witte's results is not certain. Numerous failures to infect rabbits with malignant catarrhal fever of cattle have been recorded by Dobberstein and Hemmert-Halswick (1928), Götze and Liess (1924), Stolnikoff (1933) and Miessner and Schoop (1934). In spite of his having supplied the material for the experiments of Zwick and Witte, Götze is disposed neither to accept their results as final nor to agree with the hypothesis as to the identity of the two diseases, Borna disease and malignant catarrhal fever.

Daubney and Hudson now state that they have succeeded in infecting rabbits from cattle in seven out of ten experiments (in six by intracerebral inoculation of brain suspensions and in one by the intraperitoneal inoculation of defibrinated blood) with their "head and eye" strain of malignant catarrhal fever. Symptoms chiefly referable to the nervous system were observed but these symptoms were sometimes accompanied by catarrh of the conjunctival and nasal mucous membranes. The nervous syndrome described in Borna disease was, however, not observed. Eight intracerebral passages were made with a strain recovered from a spontaneous case in cattle. A total of 37 rabbits was infected in the first six passages. They state that in the earlier rabbit passages the *post-mortem* picture resembled that of cattle dead of the disease, but after intracerebral passage the visceral lesions were progressively reduced. No intranuclear "inclusion bodies" similar to those of Joest Degen associated with Borna disease were observed in the brain of the rabbits infected with malignant catarrhal fever. The brains of infected rabbits were bacteriologically sterile. [Apparently no lesions of spontaneous encephalitis of rabbits either due to *Encephalitozöon cuniculi* or *Toxoplasma cuniculi* were detected.]

Four cattle were inoculated into the prescapular gland with brain material from infected rabbits of the third intracerebral passage. Two of these developed a disease referred to as typical of malignant catarrhal fever and died. The lesions were characteristic. As pointed out by Daubney and Hudson, the most striking difference between their findings in rabbits and those of Ernst and Hahn and Zwick and Witte is the occurrence of visceral lesions. Visceral lesions were not observed by the two latter groups of investigators, and, moreover, visceral lesions are not seen in Borna disease infection in rabbits. Further, Daubney and Hudson's rabbit strain is stated to have reproduced typical malignant catarrhal fever when inoculated into cattle, whereas in the bovine animal inoculated by Zwick and Witte with brain from the sixth intracerebral passage of their rabbit strain, the clinical syndrome bore a greater resemblance to classical Borna disease than to malignant catarrhal fever.

Daubney and Hudson state that "in view of the tendency of the virus to become more neurotropic in its affinities when passaged subdurally we have attempted to establish a strain by intraperitoneal passage in rabbits. This strain is now in its fifth passage"—but they do not state what material was employed for making the intraperitoneal inoculations.

I. A. G.

Abstracts

[Studies on Bovine Mastitis. XI.—Further Observations on the Control of Chronic Streptococcus Mastitis. Stableforth, A. W., Edwards, S. J., and Minett, F. C. (1935.) *J. Comp. Path. & Therap.* **48.** 300-315.]

It has for some time been the generally accepted belief that mastitis due to *Str. agalactiae*, that is, the common chronic mastitis of milking cows, is strictly contagious and that, therefore, it should be possible to control it by the simple procedure of avoiding direct transmission during milking or by the segregation and eventual sale of infected cows. This belief was confirmed in 1933, when Minett, Stableforth and Edwards gave an account of a herd from which the disease had thus been eradicated.

Evidence has, meanwhile, been accumulating that vaccines, autogenous or other, are of little value in the control of this disease. Some authors, it is true, believe that they reduce the more obvious manifestations of the disease, but there is evidence that they do little or nothing to diminish the number of infected udders or to prevent the spread of the disease. As a result, most laboratories concerned with mastitis are now giving more attention to control of the disease by segregation with or without treatment of infected cows.

Stableforth, Edwards and Minett now give an account of attempts to control the disease in six more herds. Latent infections were diagnosed, as before, by making cultural tests of quarter samples, these methods being supplemented by taking the chemical reaction of the milk and by noting the amount and character of the sediment. These tests were made at three- to six-monthly intervals and in three herds also shortly after calving. Infected animals were milked after the healthy ones either in the same shed or in another shed on the same premises, or they were removed to another farm and milked by different attendants.

One herd in which the original incidence of infection was 55 per cent., has now been free for three years, a contributing result being the early sale of most of the infected cows. In three others in which the original incidence was 40, 30 and 53 per cent. respectively, the number of new infections has decreased during four to five years to 9·3, 7 and 7·8 per cent. respectively in 1935. A fifth herd built up early in 1933 from freshly-calved heifers is at present free. In the sixth herd the incidence and number of new infections were at first low; the number of new infections rose in 1932, but since then has steadily fallen to 5·3 per cent. in 1935.

The results are discussed in the light of the conditions prevailing in each herd and of the degree of control that could be exercised. For instance, in two of the four herds which continued to show new infections the interval between tests could not be less than six months. In the other two of these herds the infected cows were kept in the same shed as the healthy or in sheds on the same premises, and in both herds, for reasons given, infected cows were retained far longer than would normally have been the case. Actually in all of these four herds the results are more encouraging than they appear. Thus, in general the new infections have been insignificant clinically. Also, the real incidence of infection is at present less than the above statements imply, because many cows which were classed as infected only by means of a special enrichment medium on one occasion and would not have been thus classed by the ordinary method of testing, have now been free from infection for at least two years although for the purpose of this report they are still called infected.

The experience in the present herds and in Herd B of the previous paper (1933) is held to justify the following conclusions:—

Eradication of contagious streptococcus mastitis may be achieved by the simple expedient of segregating infected cows or, if that is not possible, by milking them last. The chances of success, however, are greatly increased if infected cows can be evacuated within a reasonable time. When this cannot be done, infusion of the infected udder with a suitable bactericidal agent should prove a useful aid.

The formation where possible of a separate heifer herd is a measure of the greatest value.

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[The Biological Characters of the Streptococcus Commonly Associated with Mastitis (Str. agalactiae). Engelbrecht, M. A. (1935.) *Cornell Vet.* **25.** 4. 313-332.]

A study has been made of some of the biological features of non-haemolytic mastitis streptococci, and these have been compared with other strains of streptococci having rather similar reactions, which had been isolated from faeces or from lesions in human beings. On a basis of biochemical reactions, 103 strains of streptococcus isolated from cases of mastitis in a single herd could be classified in one group. The reactions of this group seem to be similar to those of the common English mastitis strain (group 1) described by S. J. Edwards (1932,) [*J. Comp. Path. and Therap.* xlv. 43]. Since no serological examinations of the strains were carried out, confirmation of this fact is lacking.

E. J. P.

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[The Function of the Omasum. Trautmann, A., and Schmitt, I. (1935.) *Deuts. tierärtzl. Wschr.* **43.** 12. 177-179.]

It has long been considered that the well-developed musculature of the leaves of the omasum is evidence of a mechanical function of the organ, but no direct proof of this has so far been obtained.

The authors established an anastomosis between the rumen or reticulum on the one hand, and the abomasum on the other, in a number of young goats: the omasum was thus, as it were, "short circuited." The animals withstood the operation well and showed no appreciable disturbance of growth or metabolism. After periods of up to a year they were killed and a *post-mortem* examination was carried out. The omasum of the animals which had been subjected to operation was much smaller than in control animals of similar age, and the individual leaves were smaller and thinner. The abomasum contained food particles of a size much larger than anything to be found in this organ in the controls.

These findings are considered to confirm the view that the omasum takes up already coarsely ground food from the rumen and subjects it to a thorough grinding before passing it on to the abomasum for chemical digestion.

The results also lend support to the previous work of Trautmann in which he removed by operation portions of the omasum in young goats and studied the process of regeneration of the organ. If the animal was given a diet consisting solely of milk there was in no case complete regeneration, the administration of solid food being a necessary condition for full development of the regenerated portion. E. G. W.

The Ministry of Agriculture and Fisheries has been notified by the High Commissioner for Canada in connection with the exportation of cattle, sheep, goats, other ruminants and swine from Great Britain, that in view of the continued freedom of this country from outbreaks of foot-and-mouth disease, it is no longer necessary for such animals to undergo detention in the London Quarantine Station, or in Scotland, before shipment to Canada.

The Ministry is also informed that permits are again being issued by the Secretary of Agriculture, Washington, for the *direct* importation of cattle, sheep, other domestic ruminants or swine.

Review

[Bacteria in Relation to the Milk Supply. A Practical Guide for the Commercial Bacteriologist. By C. H. Chalmers (B.Sc. [Edin.], N.D.A., Univ. Leeds). 1935. pp. xii + 192. 16 figs. on 4 plates, 31 text figs. 1 table. London: Edward Arnold Co. (8vo.) (6s.)]

The author states in the preface that this little book is intended to be of value to the commercial bacteriologist and others interested in the routine examination of milk. It is designed at the same time to help those who are making an initial approach to the subject of "milk," such as students of agriculture and dairy husbandry. Such persons will no doubt find the book useful, for they can be assured of finding in it a concise description of the methods currently used in dairying practice, whether this be in the laboratory or at the factory or on the farm.

The matter falls into two parts. Part I deals with the routine bacteriological examination of milk and of water, with taints and abnormal conditions in milk, with the isolation and identification of organisms from milk, and finally with the control of dairy plant. In Part II is given a short account of general bacteriological technique, and this is amplified in four appendices which follow. The last of these appendices deals with the bacteriological tests for graded milk, a matter which is shortly to be revised under the recent Milk (Special Designations) Order.

For the medical man and veterinarian whose main interests are concerned with pathogenic bacteria the book is of less value, and it contains misstatements or statements which are open to criticism. A few of these may be mentioned. The statement (p. 74) that only 10 per cent. of the fatal cases of tuberculosis in children under five years of age are due to the bovine type is open to question. It is news (p. 75) that *B. tuberculosis* grows very slowly in raw milk cooled below 15° C. The statement (p. 76) that tuberculosis of the udder cannot be determined by a single examination of the milk (presumably by means of the guinea-pig) is too sweeping. One would have expected (p. 78) information as to how *Br. abortus* contamination of milk may be established by guinea-pig inoculation. *Str. agalactiae* does cause coagulation of milk in the culture tube, and this organism may be haemolytic or non-haemolytic (p. 79). It has been shown (p. 82) that scarlet fever streptococci are capable of invading the cow's udder.

The admonition (p. 107) that every worker in a bacteriological laboratory should wear a clean white overall without a pocket is diverting in a small way. Many workers, particularly those who are fortunate enough to be able to wear old clothes, find breast pockets the most important part of the garment, as they are such convenient receptacles for culture tubes and other odds and ends.

N.V.M.A. Divisional Report

NORTH OF ENGLAND V.M.A.*

MEETING AT NEWCASTLE-ON-TYNE

Presentation to Dr. Bradley

A general meeting of the North of England Veterinary Medical Association was held in the Agricultural Department, Armstrong College, Newcastle-on-Tyne, 2, on Saturday, June 27th, 1936, when there were present Messrs. W. Lyle Stewart (in the chair), J. R. Rider (Hon. Secretary), Dr. Bradley, Messrs. H. S. Elphick, T. M. Mitchell, J. W. Rider, C. Nicholson, G. M. Oliver, G. F. Pickering, E. R. Callender, G. Atkinson, T. Wilkinson and J. J. McDowall, with Mr. J. P. Pickering as a visitor.

The minutes of the last meeting, having been published in the *Veterinary Record*, were taken as read and confirmed.

Apologies for absence were received from Sir Frederick Hobday, Messrs. Jackson Young, H. B. Allan, T. Johnston, C. G. Hill, A. L. Bartholomew, W. A. Doughty and J. H. Taylor.

Report of Council Meeting.—This report dealt solely with domestic matters. It contained a recommendation to the general meeting that the September meeting take the form of a visit to the Cow and Gate factory at Northallerton.

After discussion the report was adopted.

Election of New Member.—Mr. Stewart proposed the election of Mr. G. F. Pickering, of Newcastle-on-Tyne, and this Mr. Callender seconded.

Nomination.—The nomination of Mr. J. P. Pickering was received.

Demonstrations on Poultry Diseases.—At the conclusion of the meeting Mr. Stewart gave demonstrations on poultry diseases, including the application of the tuberculin test, the agglutination test for pullorum disease, the vaccination of fowls against fowl-pox, *post-mortem* examinations and the caponising of cockerels.

Presentation to Dr. O. Charnock Bradley

The Chairman suggested first of all that the wording of this item on the agenda be changed so as to take the form of a motion, *i.e.*, "That in order to commemorate Dr. Bradley's silver jubilee as Principal of the Royal (Dick) Veterinary College a presentation now be made."

*Received for publication, July 3rd, 1936.

Mr. Stewart called upon Mr. J. R. Rider, as a former pupil of Dr. Bradley, to address the meeting.

Mr. Rider said that he felt a peculiar pleasure in speaking to this motion as he believed he could claim a longer association, directly or indirectly, with Dr. Bradley than other members of the Division. It was unnecessary for him to give a detailed catalogue of Dr. Bradley's achievements, but as most of the members were Edinburgh graduates he might give a few personal impressions of their guest.

When Mr. Rider arrived in Edinburgh Dr. Bradley had completed his first year as Principal of the College. Mr. Rider recalled the striking impression formed by his first contact with Dr. Bradley, and in describing life as it existed in those days in Clyde Street emphasised the good fortune of students of the Royal (Dick) College in having Dr. Bradley as Principal. He craved the indulgence of graduates of other colleges for these reminiscences, but there was another phase of Dr. Bradley's work which claimed their recognition.

Mr. Rider mentioned that he had unearthed a record of a meeting held at Newcastle on February 26th, 1909. Dr. Bradley was the speaker of the day and he was engaged on a crusade for the amalgamation of the existing veterinary societies. "It is," he said, "of interest to note that the present organisation of the N.V.M.A. is almost identical with that which Dr. Bradley outlined 27 years ago."

That fact, he thought, made it rather appropriate that the Division should regard that presentation not only as a tribute from old students but as a tribute from a Division which appreciated his labours on behalf of the "National" and of the profession.

A matter of ten years elapsed before Dr. Bradley's scheme could be brought about, and in 1919 the first post-War meeting of the N.V.M.A. was held, to consider the purchase of the *Veterinary Record*. Mr. Rider remarked on the entire lack of funds in the early days of reconstruction and on the present healthy financial state of the Association, a condition of affairs due largely to the labours of Dr. Bradley in the first instance.

In seconding the motion, Mr. Mitchell expressed his very great pleasure and said he wished to do so because of his association with Dr. Bradley at Edinburgh and of his being one of the original students whom Dr. Bradley first taught as Principal. The presentation should be a tribute to the man, he said, and not only to the lecturer.

Mr. H. S. Elphick also supported the motion.

Mr. Lyle Stewart, the Chairman, said they had heard eloquent tribute to their esteemed friend who during the last 25 years had not only maintained but had greatly enhanced the prestige of veterinary science in Great Britain, besides earning the gratitude of veterinarians the world over. Dr. Bradley had heard, he said, the regard the Division held for him and the unanimous wish of the members to commemorate the occasion by presenting to him a little token of their esteem, this taking the form of a Chippendale armchair. On behalf of the members he had the great privilege of making the presentation, which he hoped Dr. Bradley would accept with their very best wishes.

Dr. Bradley: "I suppose that it is appropriate that I should be given an antique. (Laughter.) I have known the North of England Society for some 40 years and have just called to mind, rather lately perhaps, my first meeting with this Society. It was away back in the time when there was numbered among its members an Elphick, a Gofton, a Mitchell, a Dudgeon, a Hunter, a Wilkinson, and last but not least a Clement Stephenson. I never had the privilege of meeting the last named—I say privilege because Clement Stephenson was a pattern and an inspiration. The others I could count as friends. I remember that first meeting was held in a hotel somewhere near the station—before this building was erected, I think. What was done while I was there I cannot remember, but I do recollect that Gofton was President and that we had luncheon.

"Since those days when there was a considerable amount of enthusiasm, as you will know, the Society fell on days of apathy, but one rejoices to know that a young and much more enthusiastic generation has sprung up and thanks to the very energetic efforts on the part of members of the Society it has taken on new life.

"During those numerous years since my first meeting with the Society I have met with innumerable kindnesses from individual members of the Society and the Society itself—I have always appreciated them. I need hardly say, therefore, that to-day's little ceremony is very, very keenly appreciated by me and I can only say that I lack adequate words to thank you. I hope I may be permitted simply to say 'Thank you,' and in saying those words I mean them. I do most sincerely appreciate this most kind act and the words that have fallen from the previous speakers. It may not be healthy for me to believe all that has been said: I do hope there may be some little modicum of truth in the words of those who have been my pupils. Permit me to allow my bare thanks to convey a great deal more than appears on the face of this acknowledgment."

A vote of thanks to the President terminated the proceedings.

J. R. Rider, *Hon. Secretary.*

QUARTERLY MEETING OF COUNCIL, R.C.V.S.

Summary of Proceedings

The report of the meeting of Council R.C.V.S. which will appear in our next week's issue shows, as usual, that the actual work of the Council is done by one or other of the main committees, of which the Examination seems to be the hardest worked. One of the recommendations of that committee which was approved by the Council is to the effect that it is desirable to restrict admission to the veterinary course to candidates who are in possession of a certificate of matriculation standard, the Council having power to accept other certificates in special cases. The usual notice of motion has been given, therefore, that the regulations in regard to the admission of veterinary students shall be amended so as to provide that in respect of candidates applying for admission to the course commencing in October, 1938, they must be in possession of a certificate in general education which would admit them to a British University.

The Examination Committee also gave consideration to the proposed new Charter for the Royal Veterinary College, and made recommendations for its amendment in certain directions. The main recommendations are that the constitution of the College should provide for the establishment of an Academic Board with a statement of its rights and duties; for the constitution of a body to consider questions relating to the appointment and dismissal of members of the staff; and for defining the powers, duties and privileges of the Principal. A further recommendation was made to increase the representation of veterinary surgeons on the Court of Governors and the Council of the College.

The Registration Committee's report deals with the action taken by the Council in several cases to see that the provisions of the Veterinary Surgeons Act are observed by unqualified persons. Wherever it is reported to the College that unqualified persons are using a description which is intended to convey to the public that they are qualified, the Registrar takes all the measures that are possible under the Act to have the offence discontinued. Of the cases against members which were considered, four were founded on reports received from the police as to convictions of veterinary surgeons on charges under the Diseases of Animals Acts, the Protection of Anima's Acts, and the Road Traffic Acts. It is well that the profession should know that all such convictions are reported in due course to the Council of the College.

The Parliamentary Committee was able to report excellent work done during the quarter in connection with Parliamentary Bills. The Bills promoted by four local authorities which contained provisions relating to the inspection of stables were found to contain no stipulation that the inspection of the stables should be by veterinary surgeons. The Council lodged petitions against these Bills with the result that in three cases the amendment proposed by the Council was accepted, and in the other case the Clause was withdrawn. In another Bill the recommendation of the Council to extend the provisions of Clause 116 of the Public Health Act to the veterinary inspector was accepted. This Parliamentary work involves considerable expense on the part of the College, but the results are of the utmost importance to the profession.

The House Committee have made progress in the matter of providing additional accommodation for the headquarters of the College. A firm of architects has been appointed and plans have been prepared to provide the necessary accommodation at the rear of the building at Red Lion Square. The matter is still under consideration and further plans are being prepared.

ROYAL COLLEGE OF VETERINARY SURGEONS

Membership Examinations, July, 1936.

LIST OF SUCCESSFUL CANDIDATES

(*Continued from page* 897.)

Glasgow

FIVE YEARS' COURSE.

SECOND EXAMINATION.

Aitken, A. J.	Qasuria, A. M.
Blench, I.	Reid, A. (P)
Deane, J. S.	Shaw, J. L. (P) (A/H)
Dickie, A. K.	Steel, D. B. (P)
Donaldson, D. W.	Thomson, D. M.
Hepburn, J. P. D.	Turner, H. F.
James, Miss O. D. (P)	Watt, J.
Macrae, R. R. (A/H)	Weddell, Miss M. H. (P)
McCallum, A. M.	Weir, Miss M. B. A.

(P) Denotes credit in Physiology.
(A/H) Denotes credit in Animal Husbandry.

FOUR YEARS' COURSE.

Class B

Milligan, J. B.

Edinburgh

FIVE YEARS' COURSE.

FIRST EXAMINATION.

Alexander, F.	Constance, L.
*Alton, G. G.	Corr, R.
Bassett, C. S.	Craigen, A. M.
Birkett, J. D. (C)	Crichton, D. R. V.
Brown, G. F. (C)	Dixon, R. J. H.
*Brown, J. M.	*Edgar, T.
*Cameron, J. M.	Evans, W. E.
*Chester, W. R.	*Farrant, V. D. C.

* Denotes Second Class Honours.

FIVE YEARS' COURSE (*Contd.*).

First Examination.

Hayes, H.
Hebeler, H. F. C.
Jones, S. (C)
Lamont, A. A.
Locke, R. F.
McDiarmid, A.
†McPherson, E. A.
Mason, G. (C)
Milburn, W. B.
*Millar, J.
Noel, E. F. H.
Orr, A. E.
Pullon, I. B.
Rangappa, K. S.
Robarts, D. L. (B)
Sinclair, W. B. V.
Stuart, J. D. (C)
Taylor, J. L.
Urquhart, J. W. (C)
Watson, J.
Watt, J. A. A.
Williams, F. M.
Williamson, J. M.
Wood, D. W. (C)

† Denotes First Class Honours.
* Denotes Second Class Honours.
(C) Denotes credit in Chemistry.
(B) Denotes credit in Biology.

FIVE YEARS' COURSE.

Second Examination.

*Beaumont, G. L.
*Biggar, W. S.
Bolton, S. R. (A/H)
Calder, J. (A/H) (H)
Christie, G. J.
Comrie, K. G. (P) (H)
Curley, W. A. (P)
*Evans, D.
Foden, C. A. (A/H)
Forbes, F. W. N.
Graham, R. W. (A/H)
*Gray, J. T.
Hartley, W. (P)
Henderson, D. C. (A/H)
Keppie, J. (P) (H)
Lofthouse, F. (P) (A/H)
McAinsh, A. (P) (A/H)
Macdonald, D. (A/H)
McLaggan, R.
*Maclennan, A. J.
Newlands, H. W. C. (A/H)
Niven, M. G. (P) (H)
Millar, P. G.
Prytherch, H. W. (H)
Robertson, R. R. (A/H)
Smith, I. M.
Sutton, E. G.
Taylor, J. I. (A/H)
Watson, J. F. (P) (H)
Wilkins, J. H. (P) (H)

* Denotes Second Class Honours.
(P) Denotes credit in Physiology (including Biochemistry).
(H) Denotes credit in Histology and Embryology.
(A/H) Denotes credit in Animal Husbandry.

Third Examination.

Adams, A. J. (P) (A)
*Argo, G. W.
Cameron, I. W.
*Christie, T. E.
†Clark, W.
Clouston, D. S.
*Cowie, A. T.
Duncan, F. M. B. (A)
Farmer, C. G. (H)
Haggie, W. G.
Laird, D.
Latta, R. H. J.
Leason, A.
Low, J. J. (A) (H)
*Luke, D.
McLaren, J. J. (A)
Parry, H. B. (H)
Rae, A. G.
Ralston, J.
Renwick, C. C. (P)
Walker, R. B.

† Denotes First Class Honours.
* Denotes Second Class Honours.
(P) Denotes credit in Pharmacology, etc.
(A) Denotes credit in Anatomy.
(H) Denotes credit in Veterinary Hygiene, etc.

Fourth Examination.

Allen, D. R. (P)
Bain, A. M. (P)
Brownie, W. B. (P)
Campbell, S. R.
Carnegie, W. K. (P)
Clark, H. M. (P)
Dall, J. A. (P)
Ewart, R. H. (P)
Kochan, W. F. (P)
Norval, J. (P)
Ogilvie, D. D. (P)
Taylor, J. E.
*Whittick, J. W.

* Denotes Second Class Honours.
(P) Denotes credit in Parasitology.

FOUR YEARS' COURSE.

Class C

Bythell, D. W. P.
Caldwell, D. W.
Gray, W. S.
Koompirochana, L.
Leask, D. E.
Muir, R.
Rutherford, G. (H)

(H) Denotes credit in Hygiene.

Class D

Bryson, D. K.
Finlayson, J.
Gordon, J. G.
Littler, S. B.
McGranaghan, J. A.
Macmaster, D. B.
Matheson, R. C.
O'Neill, R. J.
Robertson, L. F.
Slinger, F. R.
Thomson, P. D.
Wilson, P. J.

In Parliament

The following questions and answers have been recorded in the House of Commons recently:—

Grass Sickness (Horses)

Mr. Henderson Stewart asked the Secretary of State for Scotland whether he is aware of the losses of Scottish farmers from grass sickness among horses; that large numbers of animals have died in recent weeks; that effective measures to deal with the disease are handicapped by lack of funds and skilled veterinary services; and whether he will take immediate steps to make available the best veterinary skill in order to stamp out the disease?

Sir G. Collins: I would refer to the reply given on June 30th to the question on this subject by the hon. Member for Banffshire (Sir E. Findlay) of which I am sending a copy to my hon. Friend. The spread of this disease is a matter of no little concern, and the possibility of undertaking a more extensive investigation into the problem is under consideration.

Mr. Maxton: Has not this trouble developed since the right hon. Gentleman withdrew the grant from the Veterinary College?

Sir G. Collins: No, it has been going on for ten years.

Mr. Maxton: That is just about the time when the right hon. Gentleman withdrew the grant.

Mr. Henderson Stewart: Is the right hon. Gentleman aware that this problem has become serious and acute within the last few weeks?

Sir G. Collins: I am well aware of the gravity of the problem, and that is why I said in my answer that I was not satisfied with the present methods.

Captain McEwen: Is the right hon. Gentleman aware that this grass sickness among horses has now appeared in Berwickshire, a part of the country where it has hitherto been unknown?

Sir G. Collins *indicated assent.*

Mr. Maclay: Will the right hon. Gentleman call the attention of local authorities in Scotland to the large increase of rabbits in some parts? It has been suggested that they may carry this grass disease from one part of the country to another.

Sir G. Collins: I will call their attention to that matter.

Notes and News

The Editor will be glad to receive items of professional interest for inclusion in these columns.

Diary of Events

July 27th.—Meeting of the Editorial Committee, N.V.M.A., at 2, Verulam Buildings, Gray's Inn, W.C.1, 4 p.m.

July 29th.—Meeting of the Derbyshire Division, N.V.M.A., at Derby, 2.30 p.m.

August 22nd.—Entries for Jubilee Memorial Bursary Examination.

Sept. 14th-18th.—N.V.M.A. Annual Congress, Scarborough.

Sept. 22nd, 23rd.—Jubilee Memorial Bursary Examination.

* * * * *

PERSONAL

Appointments to His Majesty's Household

The lists of appointments to the Royal Households published as a supplement to the *London Gazette* on Monday last, contain the gratifying announcement that the King has been graciously pleased to appoint Major Sir Frederick Hobday, C.M.G., F.R.S.E., and John Willett, Esq., M.R.C.V.S., Honorary Veterinary Surgeons to His Majesty, the appointments to date from July 21st, 1936.

Both Sir Frederick Hobday and Mr. John Willett, who is this year President of the Royal College of Veterinary Surgeons, held appointment as Honorary Veterinary Surgeons to His late Majesty, King George the Fifth.

. . . . . .

Appointment.—Mr. J. W. Macaulay, M.R.C.V.S., D.V.S.M., B.V.Sc., Glasgow, has been appointed to the Veterinary Service of Bechuanaland, Africa, with the Dominions Office of His Majesty's Government. For the past two years Mr. Macaulay has been on the staff of the Animal Diseases Research Station at Pirbright, Surrey, with the Ministry of Agriculture and Fisheries.

. . . . . .

Birth.—Jennings. At Yew Tree House, Knowle, Warwickshire, to Dorothea, wife of Sydney Jennings, M.R.C.V.S., a daughter, on June 30th, 1936.

. . . . . .

On Leave.—The following veterinary officers arrived home on leave from the Colonies, etc., during the month of June: Major H. H. Brassey-Edwards (Kenya), Mr. N. Clarke (Nigeria), Captain J. M. Culhane (Nyasaland), Messrs. R. L. L. Hart (Uganda), H. E. Hornby (Tanganyika), J. McDonald (Gold Coast) and Captain J. P. A. Morris (Northern Rhodesia).

R.C.V.S. COUNCIL MEETINGS

A Personal Incident

At the meeting of Council of the R.C.V.S. on June 26th, there was a personal incident in which one of the members of Council was involved. The facts were that at a meeting of the Farmers' Club held in London on March 2nd, Mr. J. C. Coleman, in contributing to the discussion on a paper by Mr. J. F. Blackshaw, made the following statements about the double intradermal test (*taken from the official report of the meeting*):

"I am a member of the Council of the Royal College of Veterinary Surgeons, which is the disciplinary body for the veterinary profession and the body which lays down the syllabus which the students have to pass for their examinations, and during the past year I have made strenuous efforts to provide for special provision in the syllabus that all students presenting themselves for examination shall give the examiner evidence that they are efficient in carrying out and correctly interpreting this test. I would go further than that, and I would ask the farmers' organisations all over the country to demand that every veterinary surgeon who conducts the test officially shall have in his possession a certificate given to him by a recognised expert that he is capable of carrying out the test and reading its reaction.

"In that way you could eliminate many of the difficulties which now occur."

And again:

"I think that a very good purpose would be served if all the farmers' organisations demanded that every veterinary surgeon should be able to produce a certificate given to him by a recognised expert that he is capable of doing the test and reading the reactions. Very few appreciate the extreme delicacy of the test."

At the Council meeting held in April attention was drawn to these statements and a motion was tabled expressing the Council's strong disapproval of Mr. Coleman's action.

The motion was duly seconded, but as Mr. Coleman complained that he had had no notice of the matter, and could not on the spur of the moment deal properly with it, his request that the matter be adjourned for three months was agreed to, in order to allow Mr. Coleman ample time to prepare his reply, which he promised would completely answer any accusation against him. The discussion was fully reported in our issue of May 2nd, and in view of the importance of the matter we propose to publish a similar verbatim report of the proceedings at the July Council meeting, when the Council passed the following resolution without dissent:

> "That—it having been brought to the notice of the Council that one of its members, Mr. J. C. Coleman, at a public

meeting of the Farmers' Club, held on March 2nd, 1936, urged upon all farmers to demand that every veterinary surgeon called upon to apply the double intradermal tuberculin test should be able to produce a special certificate of competency granted by a recognised expert to undertake the conduct of the test—the Council repudiates this public charge of incompetency made by Mr. Coleman against the general practitioner and views with the strongest disapproval the action he has taken."

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R.C.V.S. OBITUARY

DUCKSBURY, Orlando Atkinson, King Street, Lancaster. Graduated N. Edinburgh, December 21st, 1891; died July 18th, 1936; aged 69 years.

* * * * *

GENERAL OBITUARY

COLEMAN.—On July 22nd, Lucy Conquest, the beloved wife of J. C. Coleman, M.R.C.V.S., Swindon. Aged 59 years. After many months' painful suffering, most patiently borne.

* * * * *

BRITISH MEDICAL ASSOCIATION MEETING

The British Medical Association, at its annual representative meeting at Oxford, decided that, while the lay Press should never be used to inform patients of a doctor's change of address, there was no objection to a doctor sending circular letters to those on his books.

At the annual representative meeting a resolution was passed instructing the council to consider more active steps to carry into effect the association's proposals for a general medical service for the nation, while the general assembly carried a resolution that only milk complying with the conditions required for the designation tuberculin tested or pasteurised, or preferably both, could safely be consumed without boiling.

Sir E. Farquhar Buzzard, the new President, delivered his inaugural address on Wednesday evening, the title being "And the Future."

* * * * *

VICTORIA VETERINARY BENEVOLENT FUND

The Secretary begs to acknowledge receipt of further donations amounting to £5 15s. 0d. in memory of Professor Macqueen from the following:—

Mrs. H. Reddish
M. Samuel, Esq.

Total received, £20 12s. 6d.

* * * * *

VICEROY ON INDIAN AGRICULTURE

"'The road is now clear for a great advance in India's premier industry, agriculture,' said the Viceroy, Lord Linlithgow, in an address delivered at Viceregal Lodge to the Advisory Board of the Imperial Council for Agricultural Research, the sub-committees of which have been meeting in Simla during the past few days," states *The Times* correspondent from Simla in a message dated July 16th. "The council owes its origin to the recommendations of the Royal Commission which Lord Linlithgow headed, and to-day's occasion was the Viceroy's first formal contact with the organisation he was chiefly responsible for creating.

"During his speech the Viceroy made an important announcement. He said that, thanks to the co-operation of the governing bodies of Rothamsted Experimental Station, Harpenden, and of the Hannah Dairy Research Institute of Ayrshire, arrangements had been made for Sir John Russell, Director of Rothamsted, and Dr. N. C. Wright, the dairying expert, to visit India to give the benefit of their expert advice to the authorities. The Viceroy contended that their collaboration may be relied upon to produce results of great and lasting benefit.

"The Viceroy said that the establishment of the Imperial Council marked the acceptance by the Government of India of the most important recommendations of the Royal Commission in field research. Surveying the whole field of agricultural improvement after an absence from India of nine years, he thought it was true to say that at no time had the position of agricultural research presented a more healthy and promising appearance.

"Lord Linlithgow stated that there was no doubt that public interest in agricultural improvement was everywhere increasing. He was informed by experienced officers that the readiness to receive expert advice nowadays displayed by cultivators was in marked contrast to the indifference shown a few years ago. He urged the Board to seize with eagerness the opportunities thus presented, so that over the whole range of agricultural improvement work should be 'full speed ahead.'"

* * * * *

MILK EXAMINATION FOR TUBERCULOSIS INFECTION IN SYDNEY

A Brisbane paper reports that results of tuberculosis tests of milk submitted to the Milk Investigator by the Secretary of the Milk Board showed that of 654 samples taken from metropolitan vendors from October, 1933, to April, 1936, eight had given positive results. Since August, 1934, 148 samples of pasteurised milk had been taken, and all the tests had been negative. Raw milk from distributors' depots was not tested for tuberculosis until October, 1935. Of 35 samples taken two had disclosed the presence of tuberculosis.

In reply to questions by Mr. A. G. Hill, counsel assisting the investigator, the Secretary said that when a test disclosed tuberculosis in the milk of a suburban dairyman the supply from that dairy was immediately stopped, and each cow was tested, the infected cows were destroyed, and the dairy was then permitted to resume supply. The dairyman was supplied with raw milk from a distributing company while his own supply was stopped. At one suburban dairy, which had since been closed, 16 cows were tested and six reacted. In another case 56 cows were tested and 19 reacted. These were destroyed, 18 of them disclosing tuberculosis on a *post-mortem* examination.

* * * * *

H.M. STATIONERY OFFICE PUBLICATIONS

The undermentioned have been published recently. Copies can be purchased through any bookseller, or indirectly from H.M. Stationery Office, at the following addresses: London: Adastral House, Kingsway, W.C.2, and 28, Abingdon Street, S.W.1; Cardiff: 1, St. Andrew's Crescent; Manchester: York Street; Edinburgh: 120, George Street.

	Price Net. s. d.	*Post Free.* s. d.
STATUTORY RULES AND ORDERS, 1936:—		
*687/S.19. Milk and Dairies, Scotland. The Milk (Special Designations) Order (Scotland), dated July 3rd, 1936.	4	5

HEALTH FOR SCOTLAND, DEPARTMENT OF:—
Foods Circular 41, 1936, dated July 14th, 1936. Milk (Special Designations) Order (Scotland), (49-9999). 2 2½

IRISH FREE STATE STATIONERY OFFICE PUBLICATIONS

The undermentioned have been published recently. Copies can be purchased from the Government Publications Sale Office, 5, Nassau Street, Dublin, C.2.

	Price Net. s.	d.	Postage. s.	d.
A. 1/14 Agriculture. Fourth Annual Report of the Minister, 1934-35	2	3	0	4
STATUTORY RULES AND ORDERS:— 77/36 Milk (Percentage of Milk-Fat and Milk-Solids) Regulations, 1936	0	1½	0	0½

* * * * *

TAR AND VIRUS IN CARCINOGENESIS

A *British Medical Journal* leading article, which appeared on June 13th under the above heading, reads as follows: "Cutaneous papillomas in domestic animals, especially in dogs and cattle, have long been known, and that they are caused by viruses has been demonstrated by many observers. It is only in the last three years, however, that their importance in the experimental study of cancer has been brought to light by investigations carried out at the Rockefeller Institute by Dr. R. E. Shope and by Dr. Peyton Rous and his co-workers. The researches began with an observation by Dr. Shope[1] that the virus which causes endemic papillomatoses in cotton-tail rabbits of Western America will infect the epithelium of the skin of domestic rabbits. The infection is brought about by scarifying the skin and rubbing into the abraded area either extracts of papillomas which have been stored in 50 per cent. glycerin, or filtered extracts of fresh papillomas of the cotton-tail rabbit. The incubation period varies considerably; in American domestic rabbits it is from seven to twenty-one days, in English rabbits it varies from three to eight weeks. The virus causes proliferation of the epithelial cells by mitoses in the basal layer and the rete malpighii; the growing epithelium extends downwards to the fibrous corium and laterally under the adjacent epidermis. Eventually a fleshy growth, usually with a dry surface, projects from the skin.

"Rous and his collaborators[2] have made a careful study of this virus-induced papilloma. They have shown that when fragments of the papilloma, obtained so far as possible free from contaminating micro-organisms, are transplanted into the muscles or internal organs of the same rabbit—that is, an autoplast—the transplanted epithelial cells multiply and form tumours which are invasive and destructive, and which frequently cause death. Such tumours may be regarded as artificial metastases. When such a tumour is removed by operation it tends to recur. In morphology the tumours are epidermoid cancers. These experimental findings have their counterpart in a fairly common clinical observation in papillomatosis of the bladder. When such tumours are removed by the suprapubic route the abdominal wall is sometimes accidentally contaminated by fragments of the growth; these fragments multiply and form a tumour which is microscopically a carcinoma. It has been shown further[3] that the papilloma in domestic rabbits usually progresses by continuous alterations in the epithelial cells of the growth into a malignant tumour. In a group of ten rabbits carrying papillomas for more than six months cancer developed in seven. When malignancy supervenes invasion of the neighbouring lymph nodes takes place, and eventually, if the rabbit is permitted to live long enough, metastases form in the lungs.

"Similar cancers of the skin can be induced by painting rabbits with coal tar. The earliest change brought about by the tar is hyperplasia of the epithelium, followed by the formation of papillomas. This usually takes place within three months. If the application of the tar is then stopped the papillomas usually retrogress. In order to obtain true malignant new growths it is necessary to continue painting the skin with tar for a long period of time, usually from one to three years. When malignancy occurs the tarred areas thicken, local invasion takes place, and neighbouring lymph nodes become enlarged by growth of deposits of malignant cells.

"Rous and Kidd[3] have recently published an account of experiments in which they have combined these two methods of producing skin cancer in rabbits—namely, with coal tar and virus. Rabbits' ears were painted with tar for about three months in order to bring about hyperplasia of the epidermis. Then papilloma virus, obtained by filtering a saline extract of a papilloma of a cotton-tail rabbit, was injected intravenously. During the next fortnight—the average incubation period of the virus—nothing happened beyond the usual slight enlargement of existing tar papillomas, or the occurrence of fresh ones, on the areas painted with tar. Then in many of the rabbits the tar papillomas 'underwent extraordinary alteration, becoming within a few days discoid, beefy, and infiltrative.' The tarring was discontinued, but the tumours continued to enlarge. New tumours of obvious malignancy arose on the tarred areas where no tar papillomas had been visible. The malignant tumours that had formed so dramatically were highly anaplastic epidermoid cancers, which rapidly led to death. It is perhaps too early to discuss the significance of this brilliant experiment, but it appears to be obvious that coal tar prepares the epithelial cells for attack by a virus which has a specific affinity for the epidermis."

[1] SHOPE, R. E. *Journ. Exper. Med.* 1933. lviii. 607.
[2] ROUS, P., and BEARD, J. W. *Ibid.* 1934. lx. 701.
[3] IDEM. *Ibid.* 1935. lxii. 523.

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An annotation in *The Lancet* of June 20th reports further interesting developments: "Facts now coming to light concerning virus-tumours and chemically induced tumours in mammals and birds must cause us to consider more and more closely whether the gap between two schools of thought in cancer research is not an entirely imaginary one. The first definite evidence that carcinogenic chemicals and viruses might act in concert in causing tumours came from McIntosh's report[1] that three tar-induced sarcomata in fowls had proved transmissible in series with cell-free filtrates, the agent in the filtrates behaving like a virus. More recently, Parsons at the Royal Cancer Hospital has described a sarcoma accompanied by leukaemia in a mouse treated with a soluble dibenzanthracene

[1] MCINTOSH, J. *Brit. Jour. Exp. Path.* 1933. xiv. 422.

compound; this, it is reported[2], has been successfully filtered on four occasions.

"Now comes more startling news from Peyton Rous's laboratory.[3] Rabbits tarred on the ear began to show hyperplasia and small warts in one-and-a-half to three months. Ordinarily such warts regress if the tarring is stopped at this stage; to obtain cancers it is necessary to tar for a year or more and even then they will appear in only a minority of animals. Rous and Kidd took rabbits tarred for a short time and inoculated them intravenously with large amounts of filtrates of the Shope rabbit papilloma. After a fortnight, the normal incubation period of this virus, the growths in many rabbits underwent an extraordinary change, becoming discoid and infiltrative within a few days. Biopsies showed that numerous discrete, highly anaplastic carcinomas had appeared. Some of these developed on the basis of pre-existing tar warts, but others where none had been visible. In one instance an anaplastic cancer appeared within 22 days after the virus inoculation. The changes were progressive and usually led to the death of the rabbits within a few weeks. Rous and Kidd have failed to find any previous record of fulminant carcinosis such as this, and nothing of the sort appeared in their numerous control animals.

"It will be recalled that the Shope papilloma virus inoculateed on to the skin of domestic rabbits produces warts which at first appear quite benign, but after some months may develop into metastasising epitheliomata. The precancerous (papillomatous) period can be shortened in various ways, as by bacterial infection or injection of Scharlach R., but in the latest experiments it appears to have been abolished altogether. Few would have prophesied that the papilloma virus, which induces cancers only after several months, would, when combined with an agent having an even longer period of induction, let loose a fulminant carcinoma in a few weeks. The result is especially suggestive, since previous attempts to obtain tumours quickly by combining several chemical carcinogenic agents have failed. An attempt to interpret these findings would be premature, but it is clear that a field of research of enormous interest has been opened up."

. . . . .

In the same issue of *The Lancet* there appeared a special article on the Lister Institute of Preventive Medicine. The work at that Institute on virus infection, as summarised in the last annual report, contains interesting evidence pointing to the probable rôle of particulate viruses in the induction of malignant new growths in fowls, and we publish the following extracts from *The Lancet*: "During the past five years considerable attention has been paid by workers on virus problems at this Institute to fundamental studies on the elementary bodies which are generally believed to constitute the sole effective aetiological agents in all virus diseases. The fact that these bodies can now, by various procedures, be separated from crude virus-containing material in a state of comparative purity has greatly facilitated the study of their aetiological relationships and even in those virus diseases such as chicken-pox and herpes zoster, that so far have defied attempts to secure their transmission to laboratory animals, it has been possible by serological analysis, particularly agglutination experiments with highly concentrated suspensions, to demonstrate not only an aetiological connection between the elementary body and the virus disease but also in some cases to explore the nature of the affinities, sometimes quite unexpected, between one virus and another.

"The antigenic structure of the virus of *vaccinia* has been under investigation by Dr. M. H. Salaman (Beit Memorial Research Fellow) since October, 1935. Professor Ledingham, in collaboration with Dr. W. E. Gye, of the National Institute for Medical Research, reported in 1935 the results of experiments which indicated that the filtrable tumour-exciting agents of the Rous and Fujinami *fowl sarcomata* were probably particulate in nature. Dr. C. R. Amies has obtained further evidence that points to the same conclusion.

"Microscopical examination of actively tumour-exciting, fowl protein-free suspensions by the method of dark-ground illumination reveals the presence of numberless particles of slightly varying size. Further investigations of the properties of purified tumour-exciting suspensions are in progress.

"Professor Ledingham has for some time been engaged in a study of the relationship between the filtrable viruses of *rabbit myxomatosis* (Sanarelli, 1898) and *rabbit fibroma* (Shope, 1932), in view of Shope's observation that rabbits which had recovered from the fibroma were to a high degree protected against the fatal issue that almost invariably follows the inoculation of the virus of myxomatosis.

"Studies on acute rheumatism started by Dr. Amies and his colleagues, Drs. Schlesinger and Signey, which pointed very strongly to a *virus agent in acute rheumatic fever*, are now being carried on by Dr. G. H. Eagles with the assistance of Dr. P. R. Evans and of Mr. A. G. Timbrell Fisher, whose operative procedure in the treatment of rheumatoid arthritis gives access to abnormal synovial tissue. They find that pericardial and pleural exudates and joint fluids from acute rheumatic fever, and joint fluids and synovial membrane from acute rheumatoid arthritis have yielded suspensions of bodies which are indistinguishable from elementary bodies demonstrable in similar suspensions from recognised virus diseases. Serological studies are being undertaken to support observational evidence and it is hoped thus to confirm the findings in acute rheumatic fever, to establish a possible virus aetiology in rheumatoid arthritis, and to investigate the possibility of a relationship between acute rheumatic fever and acute and subacute rheumatoid arthritis by cross-agglutination tests.

"Dr. E. Weston Hurst has completed a study of the course of infection with *equine encephalomyelitis* virus. Unlike many neurotropic viruses, this virus does not reach the central nervous system by way of the peripheral nerves: during its circulation in the blood stream it may sometimes be detected on the nasal mucosa, whence, apparently, it reaches the brain by the perineural lymphatics of the olfactory nerve. Such a mode of infection of the nervous system was previously unsuspected, except, of course, when viruses are introduced directly into the nose; in nature the equine encephalomyelitis virus is one of a group transmitted by biting insects.

Dr. E. Klieneberger (Jenner Memorial Research Student) has continued her work on *pleuropneumonia-like organisms* as symbionts of certain bacteria."

[2] Parsons, L. D. Brit. Emp. Cancer Campaign, Ann. Rep. for 1935, p. 17.
[3] Rous, P., and Kidd, J. G. *Science*. 1936. lxxxiii. 468.

Correspondence

Letters to the Editor should reach the Office not later than by the first post on Tuesday morning for insertion in following Saturday's issue.

All correspondence must bear the name and address of the contributor for publication.

The views expressed in letters addressed to the Editor represent the personal view of the writer only and must not be taken as expressing the opinion or having received the approval of the N.V.M.A.

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"SOUND IN WIND AND EYES—A GOOD HUNTER."

To the Editor of the Veterinary Record

Sir,—Mr. Cochrane-Dyet, in his letter of the 13th instant, speaks of heart disease of the horse and particularly the hunter—of disease of varying degrees and of quite long standing. I am curious to know to what disease or diseases of the heart he refers; also what technique he employs to arrive at his diagnosis.

I would not give a certificate to say a horse was suffering from any disease of the heart unless I was certain—beyond any doubt—of the pathological lesion which existed.

J. P. Railton.

The White House,
Kington,
Herefordshire.

July 20th, 1936.

* * * * *

VETERINARY INSPECTION OF MEAT AT THE PORT OF ORIGIN

To the Editor of the Veterinary Record

Sir,—In the discussion following a paper on "Abattoirs and Meat Inspection" in the Veterinary Hygiene Section of the Royal Sanitary Institute Congress at Southport last Thursday, Captain Elliston, M.C., M.P., made a special appeal for amendment of the proposed new Public Health (Imported Food) Regulations. I enclose newspaper cutting of his remarks.*

I would suggest that all members of the veterinary profession would be doing a great service to the public and their own profession if they would write immediately to their Member of Parliament drawing attention to these observations and asking for his support.

Yours faithfully,
E. J. Burndred.

Ravenswing,
Revidge Road,
Blackburn.

July 14th, 1936.

*Our correspondent's enclosure is as follows:

Guarantee Wanted

Captain G. C. Elliston, M.P., for Blackburn and a member of the City of London Corporation, in a discussion at the veterinary hygiene section, pointed out that the new Public Health (Imported Food) Regulations should have already been in operation but were held up. It was imperative that they should attempt to secure an amendment at once. Every month they were receiving an increasing quantity of boneless meat from the Dominions and foreign countries. Under the new regulations that meat would have to bear a certificate from the port of origin, but they had no sort of guarantee that such services met an active inspection.

Inspection in foreign countries was supposed to be very efficient, but the new regulations would mean that the authorities here would have to pass meat without any concrete evidence that it was fit for consumption. The Ministry would have to be persuaded very quickly that an amendment was necessary. The City of London considered that in the interests of public health they must check methods of inspection at the ports of origin or, alternatively, exclude meat that arrived here in a form that made inspection on the spot impossible.

"The United States keep doctors in all ports to check the condition of people who want to enter their country, and I do not think it would be unreasonable to suggest that we should have veterinary officers at the ports of origin of our meat," he added.—*Northern Daily Telegraph.*

* * * * *

THE NATIONAL HORSE ASSOCIATION OF GREAT BRITAIN

To the Editor of the Veterinary Record

Sir,—May I appeal to your readers to help us to safeguard the interests of the horse, the owner and the user, not only by joining the National Horse Association of Great Britain themselves, but also by prevailing on others to do so. After all, we belong to the greatest horse breeding, horse loving nation in the world, we have a heritage handed down to us by our forefathers to keep up this reputation, and to do this we must endeavour to keep together and help in every way we can.

There are thousands of people riding to-day who want help and information; therefore our registration of riding schools and stables and approved school scheme; our keeping open of commons and parks, grass verges and the like for the use of horsemen; the untiring and unending working of the Association on the slippery road question; the very watchful eye of our Parliamentary Agents, and our constant representations to and communication with the Ministers who deal with transport, traffic and the like, I feel merit your support.

The Council of the Association is composed of representatives of every Breed Society and every trade connected with the horse, strengthened by many leading sportsmen, several of whom are Members of Parliament. The Association, on the other hand, is represented on the Transport Advisory Committee, and the London and Home Counties Traffic Advisory Committee.

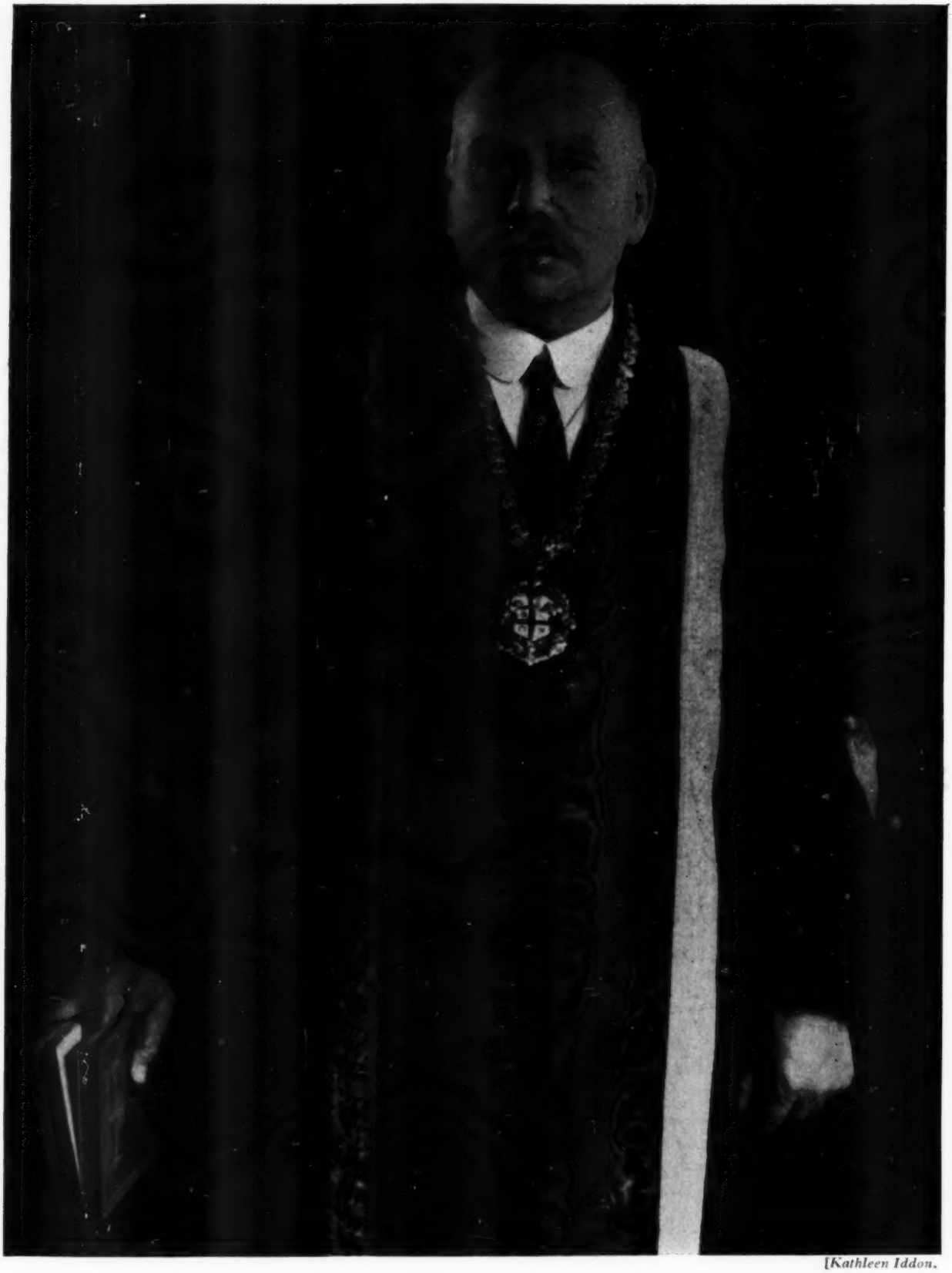
I apologise for trespassing on your valuable space, but the battle of the horse must be fought, and I am confident that members of the veterinary profession will do all that they can to assist.

Yours truly,
H. Faudel Phillips,
President,
The National Horse Association
of Great Britain.

12, Hanover Square,
London, W.1.

July 18th, 1936.

"It is a scientific fact that in turning grass and other vegetable produce into meat a third of the nutritive capacity of the former is lost; and it has been estimated that, by the time the population of the world doubles itself, very little of this wastage will be permissible if we do not all want to starve. What nobler work could the veterinary fraternity be doing to-day than to produce an animal that turns grass into meat with a loss in food value of 10 per cent. or less?"—*Morning Post.*



[*Kathleen Iddon.*

JOHN WILLETT, Esq., M.R.C.V.S.
PRESIDENT, ROYAL COLLEGE OF VETERINARY SURGEONS, 1936-37
Honorary Veterinary Surgeon to His Majesty The King